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VOLUME XIV MAY 4, 1925 NUMBER 7

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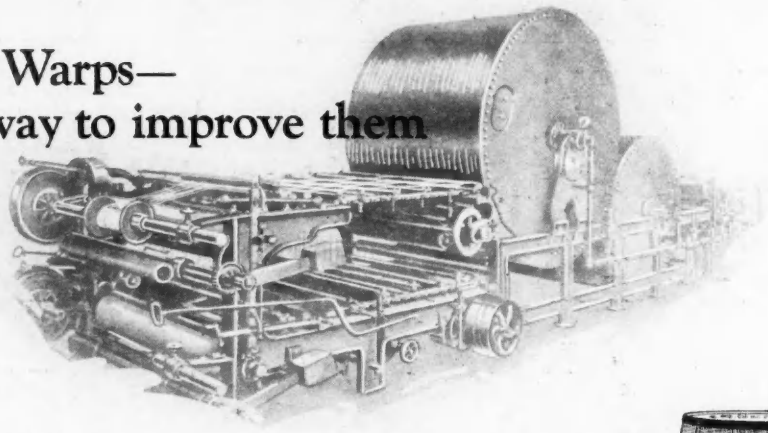

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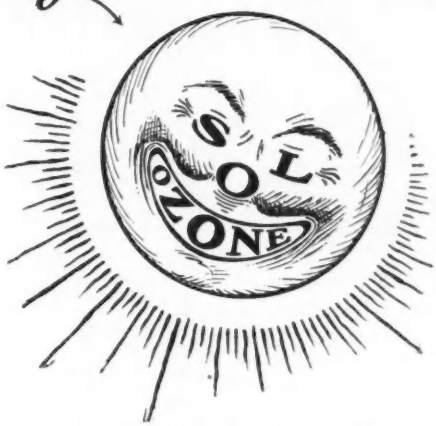
Can you solve this puzzle?



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VOLUME XIV NEW YORK, MAY 4, 1925 NUMBER 7

Dyeing Acetate Silk

Part IV

Dyeing Unions Containing Acetate Silk—Two-Color Process—Dyeing Three-Color Combinations—Dyeing Acetate Silk—Wool Unions with Basic Dyes

By CHAS. E. MULLIN, M. Sc., F. A. I. C.

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IN dyeing unions containing acetate silk and cotton or artificial silk, it is very easy to secure a wide variety of two-color effects using basic dyes on the acetate silk and direct cotton dyes on the cotton or artificial silk. Frequently these dyes may be used in the same dye bath, but usually better results are obtained by using separate dye baths. If solid shades are desired on the two fibers a more careful selection of dyes must be made and more care used in their application.

In selecting the direct dyes for use upon these acetate silk-cotton unions, care should be taken to select only those dyes which do not stain acetate silk. For this reason only dyes specially selected or prepared for this particular use should be employed, as different lots of the same dyestuff from the same manufacturer may differ in this respect due to minute quantities of basic impurities or shading dyes present in the dyestuff, which may stain the acetate silk, while the practical dye only colors the cotton. The common use of basic dyes for shading makes this difficulty particularly prevalent. However, there are several lines of special direct cotton dyes on the market which do not stain acetate silk. These are usually designated "C. R." (Celanese Resist) dyes.

In cross dyeing acetate silk and other fibers such as cotton or artificial silk in acetate silk unions, it is important to dye the acetate silk first, or the substantive dyes may mordant the basics on the cotton, thereby causing staining of the cotton or artificial silk.

In applying basic dyes to unions containing acetate silk and cotton or viscose, at low temperatures the basic dyes, of course, stain both the cotton or viscose and acetate silk; but as the temperature is raised the dye feeds onto the acetate silk from the viscose or other fibers, until at a sufficiently high temperature, especially in the presence of acetic acid, the other fibers are clear.

Of course, as the Lustron has the greater affinity for basic dyes, these dyes (basics) will not stain the accompanying fibers to the same extent as when Celanese is used, and they will feed onto the Lustron faster than onto the Celanese. As it is sometimes necessary to use a temperature near boiling to clear the fibers accompanying acetate silk, the Lustron silk is better suited for this work than the Celanese, as the Lustron has both a higher affinity for the basic dye and also withstands the high temperature better. In this manner results which at first appear very poor, may with increased acidity at higher temperatures, for prolonged periods, come out decidedly well. A proper application of soaping, as in Method No. 32 or 33 or treatment by Method No. 18, after leaving the dye bath may further increase the two-color effect. The basic dyes are best applied first to acetate silk unions, cross dyeing the cotton afterward, usually with plenty of salt to avoid bleeding of the basic dyes. The above remarks regarding the basic dyes in general apply to the gallocyanine dyes also.

To illustrate this two-color process on acetate silk-cotton unions, a bright peacock may be obtained on Celanese while the cotton is dyed a gray by the following formula:

Capri Blue GON	1.5 per cent
Acetic Acid or Formic Acid (100 per cent)	2 c.c. per liter
Sodium Chlorite	20 per cent

Enter at 45 deg. Cent. (113 deg. Fahr.) and dye at 45 to 80 deg. Cent. (113 to 176 deg. Fahr) for about one hour or until the color is deep enough, as in Method No. 14. If necessary the cotton may be cleared by Method No. 18, No. 32 or No. 33. Then cross dye the cotton with:

CR Chlorazol Fast Gray	0.3 per cent
Sodium Chloride	5.0 per cent

Enter cold and dye at 50 deg. Cent. (122 deg. Fahr.) or below for about three-quarters of an hour.

Method No. 18: Clearing Cotton in Basic Dyed Acetate Silk Unions.—In case it is desired to leave the cotton particularly white in basic dyed acetate silk unions, such as where the cotton is to remain white or be cross-dyed a light shade, a washout with a diluted acetic acid solution after dyeing will help to clear the cotton of basic dye. The direct cotton dye should then be applied in a dye bath containing sodium chloride and a small amount of sodium bicarbonate. (See also Methods No. 32 and No. 33.)

Dyeing Three-Color Combinations

In dyeing three-color combinations, such as acetate silk, viscose and real silk, using basics on the acetic silk, the acetate silk should be dyed first in a slightly acid bath, the viscose second with direct dyes using salt in an alkaline bath, followed by an acid dye for the real silk in a slightly acid bath with salt. On account of its resistance to alkalies and high temperature and its high affinity for basic dyes, Lustron again appears to be particularly suited to this class of work.

Method No. 19: Dyeing Solid Shades on Acetate Silk-Cotton Unions with Basic and Direct Dyes.—One method of obtaining solid shades on acetate silk-cotton unions is to dye the acetate silk with basic dyes and then fill up the cotton with suitable direct cotton dyes in a dye bath containing salt, soap and soda.

Method No. 20: Dyeing Solid Shades on Acetate Silk-Cotton Unions with Basic Dyes.—Another method of obtaining solid shades on these unions is first to mordant the cotton in the union in the usual manner with tannin and antimony, and then dye both fibers with basic dyestuffs at the one operation.

Method No. 21: Dyeing Solid Shades on Acetate Silk-Cotton Unions.—The Lustron Company states that Lustron-cotton unions may be dyed solid shades with the Janus dyes. In using the Janus dyes the cotton will take the dye on at a different rate, depending upon whether it is unbleached, bleached or mercerized, while the Lustron will take it on always at practically the same rate. The Janus dyes go on cotton better somewhat below the boil, while Lustron takes these dyes better at the boil, therefore when using these dyes, the dyer should use his judgment as to the dyeing conditions, i. e., temperature, etc., depending on the character of the cotton used, the particular dye, etc. Hall, however, states that the Janus, Acridine and Azine dyes are not fast on acetate silk.

Method No. 22: Dyeing Acetate Silk-Real Silk Unions with Basic and Acid Dyes.—Real silk and acetate silk can be dyed in the same bath, using acetic acid in the dye bath, with basic dyes for the Lustron and acid dyes for the real silk. In some instances it may be desirable to give a slight soaping after dyeing. A better method is to use two dye baths, applying the basic dye as in Method No. 14 or No. 15, and then dyeing the real silk in a fresh bath with the acid dye, using only acetic acid as assistant.

Method No. 23: Basic Dyes on Acetate Silk-Cotton-Real Silk Unions.—The acetate silk may be dyed as in Method No. 14 or No. 15 with acetic acid. If a white real silk effect is wanted, clear with a weak acetic acid bath as in Method No. 18, wash, and rinse in a dilute sodium bicarbonate bath as in Method No. 27. Then dye the cotton with a direct cotton dye which does not stain real silk, in a bath containing sodium chloride, soap and soda.

Method No. 24: Dyeing Acetate Silk-Cotton-Real Silk Unions in Three Colors.—One method of obtaining this result is to proceed as in Method No. 23, and then dye the real silk as in Method No. 22.

Method No. 25: Dyeing Acetate Silk-Cotton-Real Silk Unions in Three Colors.—Another method of obtaining the same result as in Method No. 24 is to dye the acetate silk and real silk as in Method No. 22. This will give the same or different colors on the acetate silk and real silk, leaving the cotton stained or white, depending on the particular dyes used. The cotton may be cleared as in Method No. 18, and then dyed the same or a different color with a direct cotton dye which does not stain real silk in the usual manner. Many acid, mordant and other common dyes, as well as the newer special dyes for acetate silk, are used in dyeing acetate silk unions and these will be discussed later.

Dyeing Acetate Silk-Wool Unions with Basic Dyes

Acetate silk-wool unions are more difficult to handle than the acetate silk-cotton unions, for while it is not difficult to find acid and other wool dyes which do not stain acetate silk, most of the acetate silk dyes and practically all of the basic dyes, stain or dye wool, and in many instances the wool is a different color from that of the acetate silk. Most of the acid dyes which dye acetate silk give different shades on the acetate silk and the wool. For instance, Citronine Y Conc. gives a greenish yellow on acetate silk and a reddish yellow on wool; Cardinal Red J gives a pink on acetate silk and a full red on the wool. For this reason it is best to select wool dyes which do not stain the acetate silk. Some basic dyes, such as Magenta and Malachite Green give approximately the same shade on acetate silk and wool but at low temperatures the wool is dyed a deeper shade. Increased acidity, with acetic acid, and higher temperatures, tend to feed the basic dye onto the acetate silk.

Method No. 26: Basic Dyed Acetate Silk-Wool Unions.—The acetate silk may be dyed with basic dyes as in Method No. 14 or No. 15 with acetic acid, and the wool dyed in the same or a fresh bath, as in Method No. 22. Many of the Ionamines and other special acetate silk dyes are useful on these unions and will be discussed later.

Method No. 27: Aftertreating Lustron.—Always after treating Lustron with an acid solution, such as in applying basic dyes in an acetic acid bath, it should receive an aftertreatment for from one-quarter to one-half hour with a cold solution containing one-fourth to one per cent bicarbonate. The Lustron should then be hydro-

extracted and dried without rinsing. This insures that no acid is left in the goods. In selecting dyes for use upon Lustron or unions containing it, only those should be used which do not strip or bleed with this after-treatment.

A recent patent by P. Rabe, U. S. Patent No. 1,517,581, December 2, 1924, covers the use of solvents such as pyridine and its compounds, for instance, methyl or amino pyridine in dye baths for the application of basic dyes to acetate silk. Many other solvents are used in the application of dyes of the Dispersol class, which will be discussed later.

The Gallocyanine Dyes on Acetate Silk

The gallocyanine dyes are of the basic mordant class and Claval discovered that many of them could be applied directly to acetate silk. The gallocyanine dyes have an affinity for acetate silk by virtue of both their basic function, due to the alkylamine groups, and the phenolic function of their gallic acid groups. They give violets, blues and grays, many of which have good fastness to light and washing. Prune Pure, also known as Violet PDH, is particularly fast, giving shades from lavender to rich navy. Modern Violet, Coreine RR, Gallamine Blue and Gallo Sky Blue are also used. Celestine Blue B gives good results but is not very level dyeing. Many of these dyes are sensitive to metals and copper vessels must not be used unless ammonium sulphocyanide is included in the bath. The dye should be dissolved cold and the scoured fiber entered into the cold bath to prevent unevenness. The goods should be soaped after dyeing, and the colors may be fixed and developed by an aftertreatment with bichromate and acetic acid. The gallocyanine derivatives, such as Brilliant Alizarine Blue G, also dye acetate silk, provided they do not contain more than one sulphonic acid group. The addition of chromium acetate to the dye bath when applying the gallocyanine dyes will improve the fastness of some of them to washing.

Method No. 28: Gallocyanine Dyes on Acetate Silk.—They are applied in a 25 or 35 to 1 dyebath with acetic or formic acid and salt, as in Method No. 14 or No. 15. The material should be rinsed after dyeing and for heavy shades soaping at 45 deg. Cent. (113 deg. Fahr.) may be necessary to avoid rubbing. These dyes do not exhaust very well but give brilliant shades.

Method No. 29: Dyeing Acetate Silk by the Ammonium Thiocyanate Method.—Among other special methods of dyeing acetate silk, Briggs and Palmer in U. S. Patent No. 1,398,357, November 29, 1922, and the British Cellulose & Chemical Company in British Patent No. 158,340, October 31, 1919, cover the use of ammonium thiocyanate as well as sodium, potassium and calcium thiocyanates to facilitate the dyeing of acetate silk with Methyl Violet, Coomassie Acid Blue R, Dianol Fast Red K and many other dyes. The fiber may be treated for from two to sixty minutes in a 2 to 25 per cent solution and then rinsed, previous to dyeing, or the thiocyanate may be applied in the dye bath with the dye. These thiocyanates have a certain action on acetate silk which renders it more capable of absorbing and retaining soluble dyestuffs such as basic, acid, direct and vat dyes which have little or no affinity for acetate silk. However, the results are not entirely satisfactory and the process has not come into general use. Too much thiocyanate will dull the luster of Celanese and possibly also that of Lustron. Hall states that a microscopic examination of acetate silk treated with ammonium thiocyanate shows the surface to be crinkled. Wilson points out that the dyeing properties of viscose artificial silk are much increased when the surface is crinkled. Hanney suggests that thiocyanate has quite an action on cellulose itself at certain concentrations, and it is possible that the action on acetate silk may in some respects resemble the mercerization of cotton.

(*To be continued.*)

NEW "NATIONAL" COLOR

As a result of extensive research on the part of the National Aniline & Chemical Company, Inc., that company has succeeded in developing a new direct dye, never before produced, which has been designated National Solantine Red 8BLN. This dye is of a new chemical composition, and its characteristics distinguish it from all other dyes of its general class. It has a distinctive fastness to light. It is a direct color particularly intended for cotton and is applied in the usual manner for such dyes, in a slightly alkaline bath in the presence of Turkey Red oil or soap, or for heavier shades, with Glauber salt or common salt. As a self-color, National Solantine Red 8BLN produces various shades of red, pink and rose, dyes level, and possesses general good fastness to light, perspiration, washing, chlorine, alkali, etc. Owing to its excellent solubility and consequent penetration, it is recommended for dyeing closely woven fabrics. This new dye may be used in combination with other Solantine dyes for the production of compound mode shades. It does not stain animal fibers and it will therefore prove useful in the dyeing of union fabrics where two-colored effects are desired. It possesses unusual fastness in light shades.

"ACCURACY"

The merchandising section of the Better Business Bureau of New York City has created for itself a voice through which it can speak to its members on developments in its commendable field of endeavor. The voice is called "Accuracy," and it is an organ dedicated to integrity in advertising and selling and to confidence in business—noble principles, both of them, in this great commercial world of ours. The April number of Accuracy, Vol. 1, No. 1, was recently issued. The leading articles deal with deceptive advertising and selling practices, and other interesting items tell of the co-operation of newspapers and similar metropolitan interests in the work of the Better Business Bureau.

Chemistry at the Size Kettle*

Modified Starches—Softeners—Properties of the Size Film—Chemical Function of the Sizing Compound

By HERMAN SEYDEL

In collaboration with A. H. Reiners

TWENTY odd years ago—looking into the possibilities for a career—I decided that better sizings would be needed and that a life devoted to this problem would bring plenty of adventure if not a golden harvest. I have found plenty of adventure; indeed, the size man seems to be blamed for everything under the sun. This may be hard on him but it also makes him the keener.

American specialists have not only successfully supplanted all competition from across the seas, but are even shipping their compounds to highly protected foreign countries. To me this is the best proof that our theories have been correct and there is little need of recalling that twenty years ago chemical compounds looked suspicious if not harmful to most mill men, whereas now practically every mill man realizes that the making of sizings belongs to the realm of chemistry.

The main argument I propose to offer is that the chemical process necessary for the making of the ideal size should take place in the size kettle itself and not at the starch factory where starch chemists have attempted to locate it.

My first task will be to discuss modified starches and to show that normal starches are better suited to your purpose; my second will be to show you the effect of the chemical size on the normal starch and the kind of film you should endeavor to obtain.

It is hardly necessary to discuss the whys and wherefores of the use of starch in the making of warp dressings, for starches are now universally used for this purpose not only on cotton but on jute, flax, artificial silk and wool to the practical elimination of all other colloidal substances.

Modified Starches

Modified or thin boiling starches are produced by the action of small amounts of inorganic acids in the presence of moisture at comparatively low temperatures under pressure. The acid is then removed by washing and neutralization with alkali. This is a difficult process and some acid always remains present which interferes very greatly in the making of a good size.

The same process at higher temperature results in the formation of glucose or corn sugar, though in the manufacture of thin boiling starches the action is stopped before the envelope of the starch granule has been disrupted. This results in a starch that in physical appearance resembles the normal or unmodified material, but differs in its action during heating, the modified starches on boiling producing a less viscous solution than would be made from the same amount of normal starch.

The advantage claimed for this type of starch is that the thinner size permits of better penetration of the yarn, and this in turn is said to make for less shedding at the loom. Also that with thin boiling starches of higher fluidities a great amount of starch may be dissolved and still produce a size not too heavy for practical application. To some extent both of these contentions are true, though it has been demonstrated that the penetration is not as thorough as was at one time claimed, and that extreme penetration is not of supreme importance in the production of well-sized yarns.

This raises the question of what is a well-sized yarn and by what criterion shall it be judged? Answering the second part also answers the first. A yarn is well sized when it weaves without breakage and without loss of weight due to shedding. That is self evident and is true for both lightly and heavily sized yarns.

Having stated our ideal of a sized yarn, the next question is, what are the important factors governing the production of an ideal dressing? A good size should be uniform in composition and consistency, and should possess tensile strength and flexibility, as well as adhesive properties, and should be capable of transferring these properties to the yarn; and for this purpose it should possess sufficient penetration to achieve this end.

Uniformity in composition and consistency is essential in order that the yarns in passing through the size box may absorb the size evenly; and this phase of the matter has been pretty well taken care of by the manufacturers of slashers in providing size circulating systems, temperature regulators, etc.

Since the prime function of the dressing is to cover the yarn with a protective film, much as paint forms a protective film for porous wood, it is essential that this should possess inherent strength in order that it might fulfill this important function. Yarn covered with a size which forms a weak film, or no film at all, cannot and will not be adequately protected during the stress and strain of weaving. The protection afforded is in *direct proportion to the strength of the film of size.*

The strongest film, however, would be totally inadequate for the service required, did it not possess the equally important property of flexibility. It is to provide this that fats, oils and chemical softeners are necessary

*Read before the Southern Textile Association, April 15, 1925.

for the production of a suitable size. Their proportions may and should vary with the yarn and the purpose for which the size is intended, but it is impractical to produce a good dressing without adding them to the starch, for they play an important part in altering the tensile strength and adhesive properties of the dressing.

In the main, softeners divide themselves into two classes, fats and oils on one hand, and hygroscopic or water attracting materials on the other. Proper blending of both is necessary to obtain the best result.

When fatty or oily materials are added to a starch paste and thoroughly incorporated by the agitation produced by mixing and boiling, the oil is broken up into minute droplets, microscopic in size or even smaller, dispersed throughout the mixture to produce an emulsion. The viscosity of the starch paste prevents their coalescence, and they in turn modify the viscosity of the size, as well as affecting it in other ways. The adhesiveness is strongly modified, as is necessary, for without this we would have the warps sticking to each other, the cylinders and everything they come in contact with.

Hygroscopic softeners on the other hand are freely soluble in water and disseminate readily throughout the size. Their function is to attract water from the atmosphere and prevent the excessive drying out of the size film on the warps. To some extent they increase the adhesiveness of the size by reason of this very property. They are essential to the production of a good size, however, as the fats alone cannot prevent excessive dryness. Drying out increases the percentage of fat, with consequent loss in adhesive power, which results in shedding—and that means trouble, with a capital T.

Having outlined the physical aspects of a good dressing we come back to the important question of what starch to use to insure correct application of these desirable features to the yarn. A thin boiling starch readily suggests itself, as indicating penetration of the size. This might be desirable if it could be secured without sacrificing more important properties.

When a cross section of sized yarn is examined under the microscope it is found that the starch or size is present as a thin outer layer surrounding the bundle of fibers, and that it does not penetrate into the individual cotton hairs, but only surrounds them and works its way into the bundle for only a very short distance. This is explained by the fact that when the size comes in contact with the yarn the water is quickly absorbed from the size by the fibers, which results in a film of concentrated size forming immediately around the yarn; this concentrated film is so viscous that the particles are unable to penetrate further. As a result, whether normal or modified starch is used, the size does not penetrate the yarn completely. There is no filling up the spaces between the fibers with a cement-like material that binds them into one solid rod-like mass, but only a comparatively thin film of size to penetrate but a little way between the fibers on the outside of the yarn. This fact is of the utmost importance and must not be lost sight of.

Properties of the Size Film

The size film must possess toughness and flexibility, so that it may bind and protect the outer fibers. It must possess adhesiveness so that it will stick to its job, and it must have tensile strength so that it will not disintegrate and so fail in its mission.

As stated, modified starch is produced by the action of dilute acid. If a 90 fluidity starch is wanted the action is continued for quite some time; if 60 fluidity is desired a somewhat shorter acid treatment is necessary; still less for 40 fluidity, and so on. But all are produced by the same general method, the principal variation being the time that the acid is allowed to act.

It would be strange, indeed, if this strenuous treatment had no effect on the starch other than to cause it to form a less viscous paste. The very fact that the starch boils thin is an indication of a profound change in its chemical composition, and it would be reasonable to assume that its physical characteristics other than viscosity may also have been modified by this treatment. Investigation shows this to be true, and it has been found and repeatedly demonstrated that the films resulting from thin boiling starch sizes are considerably weaker than those formed from normal starch treated in a similar manner.

A starch grain has been aptly compared to an egg, the shell of which must be broken before its contents can be utilized; and a solution of boiled starch can be considered similar to an enormous number of broken eggs with the broken shells mixed throughout the mass. In fact, it is the broken envelopes of the starch granules that give to a starch paste its body or viscosity and its strength, hence its name, amylopectin = starch jelly-former.

Carrying the simile further, we can readily see how treating the unbroken eggs with dilute acid would cause them to break more easily, by dissolving the shell to a greater or less extent, and that the more the shell was dissolved the less strength it would have to impart viscosity to the solution.

And so it is with the starch grain. The longer it is treated with acid, the more quickly does it break and the less viscous is the resulting solution.

The strength that nature imparted to the starch grain has been destroyed by the acid treatment. The lack of strength in modified starch films is thus seen to be a logical outcome of the treatment it has received.

And thus we find upon examination that the properties of thin boiling starches are obtained only at the sacrifice of its most important property, tensile strength.

I have before me samples of dried dressings made of a chemical size and corn starches of different fluidities.

Sample No. 1 is of so-called 90 fluidity. You can see that upon drying no film is formed, the little round globules possess no adhesiveness.

Sample No. 2 is made of 60 fluidity starch and also forms the same sort of round crystals that may be useful in finishing certain silken fabrics but which are of no use to the slasherman.

Sample No. 3 of 40 fluidity begins to show better film-producing qualities.

Sample No. 4 of 20 fluidity shows no better than 40, probably because of the acid which was not completely removed from the starch.

From none of these can you observe any of the qualities that the size film should have.

Sample No. 5 of normal or unconverted starch shows a real film, such a covering as will effectually protect the warp in its journey through the manufacturing processes.

All of you can see the vast differences between this dressing and those made of converted starches. I am sure that each one of you will be astounded at the wide variation between the two types of starch and the small variation between the dressings prepared with 20 or 40 fluidities, and the higher fluidities.

I am quite convinced that the absence of a definite degree of filming property is due to difficulty encountered by the starch maker in the removal of the acid from the converted product, and therein probably lies the reason why modified starches have not been standardized.

This condition makes it necessary for you to abandon the use of acid treated starches and to rely on the product of nature itself.

This argument brings us to the discussion of applying the necessary chemical process right at or in the size kettle.

You are probably all using some chemical compound, and those few of you who attempt to do your own chemical work are usually in such hot water that sooner or later you will appreciate the value of the service we textile chemists can render you.

Custom and ethics forbid that I unduly blow my own horn, but I think we are agreed that the simpler the task is made to the slasherman the less he is burdened with the solving of the intricate problems of chemical warfare, the more even and the more satisfying will his work be to you weavers.

The task, therefore, of the chemical size maker is to offer one compounded article which will so affect the starch as to produce the ideal size film.

Before discussing the properties of such ideal film, may I briefly state that chemical compounds differ in their action on the starch because of factors which are not easily recognized, which factors form the basis of the theory used by each individual manufacturer.

Many of you have had our products analyzed; frankly you asked more of the analyst than he could well furnish. We all know about fats, gums, chlorides, hygroscopic agents, mineral matter and so on, and we also have a speaking acquaintance with saponifiables and unsaponifiables, but why it is that two sizes made by different makers and analyzing practically the same will in one case show 97 per cent production in the weave room with one-half to one per cent of seconds and the other barely bring 89 to 90 per cent total production?

The reason lies in the fact that no analysis has ever brought out the chemical fundamentals of a sizing compound of real value. This is why we size makers have been able to bring you to the point of relying upon us for size service, just as you rely on other experts for service in planning your mills or building your equipment.

Chemical Production of the Sizing Compound

This brings us to a discussion of the function of the chemical compound in the size kettle.

In the first place let us dispose of the matter of starch or starches. We have shown you that we believe in the use of unmodified starches and we further believe that the mixing of starches is of distinct advantage for many purposes. For instance, on very coarse and open yarns such as go into osnaburgs, economy and efficiency will be served by the use of possibly two or three parts of pearl corn starch to one of a medium grade tapioca, which happens at present to be low in cost. The film so produced will show better flexibility and decidedly more strength than that made of 20 or 40 fluidity corn starches.

On medium yarns the construction of the cloth has considerable bearing on the type of dressing necessary for maximum production, but the more exacting are the demands the less should you attempt to use converted starches because the size films made with them are weak and crumbly. If any be used it is clear that they should not form the bulk of the starch used.

On very fine yarns where the cost of the dressing is not a material factor, the best sizes will be produced by the mixing of two starches, such as corn and potato, or corn and wheat. The benefit derived rests on the difference in the filming properties of these individual starches, for two starches combined make better films than either component!

Having disposed of the starch question let us consider the effect of a properly compounded sizing material on the starch. This has been studied by the making of thousands of films, which I am sorry to say I could not exhibit here as I had no means of keeping them from deteriorating after a indefinite period. The making of these films and their careful study under the microscope and otherwise has thrown considerable light on the fundamentals of our work.

In the first place the fat content of the size has no proper function except that of lubrication, and this function may in turn be divided into two part, the first in the size kettle itself where the minute particles of oil break down the adhesive properties of the size; the second where the same fat keeps the size from sticking to the cylinders of the slashers and later to the reed and harnesses of the loom.

We all know that a certain amount of fats is necessary to every warp dressing, but we also know that we have a much better understanding of the quantity necessary than did our forefathers who had to rely on tallow and soured flour for all their needs.

We know from laboratory as well as practical experiments that tallow is far from being the best lubricant or fat, and that as the tallow pot has been eliminated from

(*Continued on page* 303)

Proceedings of the American Association of Textile Chemists and Colorists

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MARCH MEETING OF THE NEW YORK SECTION

The March meeting of the New York Section of the American Association of Textile Chemists and Colorists convened at eight o'clock, March 27th, in Stewart's Restaurant, 30 Park Place, New York City, Edw. F. L Lotte, Chairman, presiding.

After the regular routine business of the Section had been transacted Chairman Lotte introduced the first speaker.

Chairman Lotte—If there is no further business we will go right on with our program. We are going to take up to-night the subject of finishing of textile fabrics. We are glad to have with us Professor Arthur A. Stewart, in charge of finishing at the Lowell Textile School, who is going to take up the subject of woolen and worsted finishing. After Professor Stewart has spoken, we will have a discussion of the subject, in accordance with our usual custom. I know he needs no introduction, and the meeting will be entirely informal. (Applause.)

Professor A. A. Stewart—Mr. Chairman, and Friends, if I may use the word "friends," because I have met to-night some old students of mine, among whom are your Secretary, Mr. Knowland (and it is certainly a pleasure for me to see his face again; it is a number of years since I have had that pleasure), and I am also extremely fortunate in having the pleasure of again meeting my old classmate, "Bobby" Sleeper. "Bobby" Sleeper is an old resident of Lowell and knows the town I come from. He was a pretty good boy up there, but I am not going to tell you all I know about him. He might object.

I heard a story the other night which may fit this occasion or not, but I am going to take a chance and tell it anyway. It is told about Chauncey Depew and his wife, who were traveling in Europe making the Grand Tour. While in Paris they spent several hours one day in one of the art museums. At last they came to a picture, a splendid painting, which was creating considerable comment. It depicted Daniel in the den of lions. Mrs. Depew didn't seem to enthuse very much over the picture. Finally, Chauncey said, "What is the matter? This is a very fine painting, my dear. Why is it you are not enthusiastic about it?"

She replied, "I can't understand it. There is something wrong. I can't understand why the lions have smiles on their faces."

"Oh," he said, "that is perfectly all right; they know there won't be any after-dinner speeches." (Laughter.)

Woolen and Worsted Finishing

By PROF. ARTHUR A. STEWART
Lowell Textile School

The real purpose of my presence here to-night is to speak to you on woolen and worsted finishing. This is a rather large order and I am at a loss where to begin. I can't very well confine myself to any one operation and enlarge on it because that would only be covering a very small part of the woolen and worsted finishing operations.

The finishing of woolens is divided into two major groups. First, we have the finishing of woolens, and secondly, we have the finishing of worsteds.

A woolen fabric as we understand it is one made from yarns spun on the woolen principle. Worsted fabrics are made from yarns spun on the worsted principle. The

difference between these two yarn structures is entirely in the mechanical arrangement of the fibers.

Woolen spinning consists of drawing and twisting the fibers at the same time. The result is that the longest fiber moves toward the center, forming the core of the yarn, and the remaining fibers take their place in the yarn, according to their length. The final result is a very fibrous looking yarn and one that is especially adapted for the production of a felt.

In worsted spinning the roving is first drawn and then twisted. The result is a yarn in which the fibers are parallel, and although there is a so-called beard on the surface of the yarn, it is not to be compared or confused with the fibrous covering forming the outer surface of a woolen yarn.

The woolen yarn is better adapted for the production of a felt, and is designed primarily for fabrics requiring a felt as the basis for the finish.

A woolen fabric or a woolen yarn may be made from a great variety of materials. A woolen yarn may be made from all wool of varying lengths and qualities, depending on the type of finish required in the fabric. It may also be made from mixtures of reworked wools. We also have mixtures of cotton, silk, and so forth. A woolen fabric in most instances requires extreme skill and care to produce a merchantable fabric.

The simplest sequence of operations necessary for the production of a woolen finish such as a cheviot consists of, first, the burling and mending operation; second, fulling, or as it is sometimes called, milling; next, washing, hydro-extracting, tentering and drying, steam brushing, shearing, steam brushing, pressing and conditioning, after which the cloth is inspected for perfection of manufacturing. Not a single operation in this sequence which I have given, with the possible exception of steam brushing, can be omitted if we expect to produce a correctly finished fabric.

Burling and mending is a corrective treatment. The cloth as it comes from the loom—or, as we frequently say in the mill "in the grease"—has several defects, many of which are due to poor yarns. Other defects are imperfections due to weaving, such as threads out, mispicks, and colors in the wrong place, etc., and finally, there is always present a great number of knots which must be removed.

In a woolen fabric of the cheviot type, one which is to be felted, burling, which is the removal of knots, is a more or less superficial treatment, only those knots being removed which will not cover up during the finishing operations.

In the better grades of goods, having a close, thready finish, such as serges, burling must be carried to the extreme and every knot removed; otherwise small holes will be produced during the shearing operation and an allowance will have to be made to the purchaser.

Mending is, as the word suggests, a mending of the piece, such as sewing in of missing threads, or changing threads which are not in their right places, cutting out coarse and thin threads and sewing in threads of a correct diameter.

In fancy fabrics great care must be taken to see that the colors are continuous and unbroken. If this is not done, a spot will show in the finished cloth and an allowance will have to be made, unless the cloth is mended in the dry finishing by girls known as "finish-menders" or "fine sewers." This operation requires more skill than mending in the grease.

The second operation, and the most important one by far, which I gave in the sequence of operations is fulling. Fulling is the mechanical method we have of producing a felt. A felt is an entangling of the various fibers, which produces the condition we refer to as a felt or cover, "cover" being used in the sense that the felt covers the surface of the fabric. In this respect it might be interesting to go back a few centuries and in a very few words tell how the first fabric was finished.

The first fabric was the typical homespun. The yarns were spun and the fabric woven by hand with the plain weave, which is the simplest interlacing of warp and filling threads there is—one up and one down. This crudely made fabric was then placed in a hollow receptacle or trough with some cleansing material, and trampled with the bare feet.

This was a crude cleansing operation. It also produced sufficient shrinkage or contraction in the piece to develop the necessary amount of firmness to have the fabric hang and hold its shape as it should.

As time went on, some bright mind conceived the idea of substituting for the feet a series of wooden blocks called hammers. These blocks were attached to long wooden arms fulcrumed at one end. A crude camshaft consisting of a cylindrical piece of wood having a few pegs on its surface operated the hammers. The peg, as it came in contact with the end of the hammershaft, raised the hammer, and gravity allowed it to drop. The beating action thus obtained produced the necessary shrinkage and the desired felt.

The next development was a machine known as the crank-stocks, in which the wooden blocks called "kickers" were driven by means of a crankshaft, thereby developing a definite pounding action which increased the rate of shrinkage and, of course, the production.

The next and what may be called the final development up to the present time took place about a hundred years ago, if my memory serves me correctly, when the present rotary fulling mill was developed. In the rotary mill the cloth is run in what is known as the string or rope form. The two ends are sewn together to produce a continuous piece of goods. The cloth passes between two rolls known as the main rolls, after which it passes into a

rectangular shaped box with a hinged cover which may or may not be weighted, as occasion requires. The main rolls in the fulling mill control the rate of shrinkage in width, and the continuous forward movement of the cloth. The rate of shrinkage in the fulling mill determines the degree of felt produced in any given fabric.

In order to produce a felt we must have shrinkage, but a fabric may be shrunk in its width and in its length and have little or no felt. Time is necessary to allow the entangling of the various fibers so as to produce felt, and the time is regulated, as I think I have just told you, by means of the pressure.

The trap which is the rectangular box back of the main rolls, controls the shrinkage in length and thereby determines the weight of the finished fabric. To be sure, shrinkage in length helps to produce the necessary fiber entanglement.

In the fulling operation three things are necessary, namely, pressure, moisture and heat. The pressure is mechanical, and I have briefly explained it. The moisture may be soap, fulling oil or acid. Heat is developed by friction and it has a softening action on the wool fiber. It also increases the curl in the fiber, causing a shrinkage, which helps to develop the necessary entanglement to produce a felt.

Soap also acts as a lubricant. If the cloth is not properly lubricated one or two serious defects will be produced, such as chafed goods, a bare finish, and cloudy goods in piece dyes, etc. Chafing is caused by the severe friction of the main rolls and other parts of the mill on the poorly soaped cloth. Again, if the pressure on the top roll is not sufficient, the cloth will have an intermittent motion and the result is the production of more or less severe chafe marks, which, of course, mean an allowance in the finished goods.

The fulling soap—soap and alkali—also saponifies the oil, loose dyestuff and other foreign material present in the fabric. This is removed in the subsequent operation of washing.

Too high a heat in the fulling mill quickly affects the brilliancy of the color on fancy goods, and in many instances causes bleeding, which, of course, as you know, is a very serious trouble. The heat is kept at a reasonable temperature, anywhere from normal up to a possible maximum of 100 or 110 deg. Fahr. As the felting quality of the wool deteriorates or as reworked wools are used, a higher heat is necessary in the fulling mill in order to obtain the necessary shrinkage. High heat also tends to produce wrinkles and creases.

A fulling mill wrinkle, if it is typical, is a distinct break in the structure of the fabric. I do not mean by this that the cloth is torn, but the streak, in many instances, will run to a rather sharp depression on one side and on the other a more or less prominent ridge effect is noticeable. These fulling mill wrinkles are produced by too much pressure in the fulling mill, too high a heat, too much or too little soap, etc. In the last instance, when there is not enough soap, it is due to the fact that the fabric is not sufficiently pliable to yield to the pressure as it passes between the main rolls, and finally a crack develops. In the instance of oversoaping, the same defect is due to the fact that oversoaping prevents the cloth from running in the mill in a lofty, open condition. Running continuously in the same fold will always produce a fulling mill wrinkle. So the body of the soap and the temperature of the mill are very important factors in all fulling operations.

To prevent wrinkles use the right pressure and maintain a proper condition of soap body. In addition to this, we resort to a treatment known as tacking. Tacking consists of folding the cloth lengthwise, usually face on the inside, and sewing a tacking stitch along the selvedge, or listing of the fabric. The result is a continuous bag. The pressure developed by the squeezing action of the main rolls forces the air along the inside and a pronounced ballooning action develops; that is, the cloth blows out under the action of the air and changes the folds. This is one of the great preventive measures for both fulling mill and washer wrinkles.

Fulling mill wrinkles are more likely to develop on hard fabrics that do not bend or yield under pressure readily, or fabrics that are too closely set in their warp structure; as such fabrics shrink, they develop into boardy, handling fabrics.

Wrinkles are also produced in washing, and when produced in this process we speak of them as washer wrinkles. Usually there is very little difficulty in differentiating between these two types of wrinkles.

I have brought a sample of a fulling mill wrinkle with me. I think you will be able to see the wrinkles if you get the goods in the proper light. This sample is a cheviot worsted, and the small piece attached is the same fabric as it came from the loom. Feel the harsh, wiry effect in this greasy sample. The larger piece is the finished fabric. It does not feel very smooth, but a cheviot of this type is not supposed to have a smooth handle.

Defective work is also produced in the fulling mill by the use of a wrong fulling soap; that is, a soap having the wrong proportions of soap and alkali. This invariably means that the fabric leaves the fulling mill in a dirty condition. If it is a fancy fabric, the colors are not bright and a rancid odor frequently develops. If it is a piece dye, shades and clouds develop during coloring.

Similar troubles are produced by poor washing. If the fulling process has been properly carried out and cloudy effects show after washing they are due in most instances to the imperfect removal of the fulling soap. This may

be caused by too short a rinsing period and is one of the more or less common faults in washing. Thorough rinsing during the washing operation is absolutely necessary to prevent the production of streaks and clouds.

Previous to removing the cloth from the washer and after all the soap is removed (or is supposed to be removed), the cloth is cooled. Cold water is turned on slowly, care being taken not to cool too suddenly; otherwise harshness is likely to result. If the cloth is not properly cooled before it is taken from the washer and placed on a truck, creases will develop which are known as "laid crimps."

This sample of serge is marked "Washer holes and chafe marks." You can see the holes and you should have no trouble in seeing the chafe marks if the light is good enough.

Chafe marks are produced in the washer for the same general reason that they are produced in the fulling mill, viz., the slipping of the cloth at the main rolls. Sometimes these chafe marks are very faint, and simply show a slight change in color. I have a sample of a washer wrinkle I want you to examine carefully. If you will draw your hand across the wrinkles, you will readily detect the ridge I was referring to a few moments ago. We know this is a washer wrinkle because the piece of cloth was never in a fulling mill. It is a very typical example of a washer wrinkle. Some wrinkles are very much smaller and very difficult to see, and many do not show until after sponging. You must get the right light reflection in order to see them.

Another trouble frequently run across is indicated in the sample marked "Showing mixed filling." Shades or rowy effects frequently result due to a mixture of wrong yarns; that is, the yarn become mixed in the filling bins and a bobbin gets into the wrong fabric. Unless the stock, the size of the yarn and the twist are exactly the same, a variation in shade is going to result. This is easily noticed for the rowy effect runs straight across the fabric, following the line of filling. So a dyer shouldn't be blamed for this defect anyway.

During the dry finishing operations, and, by the way, it might be well if I defined the dry and wet finishing. Wet finishing comprises all the operations in which the cloth is in a wet condition (that is stating it broadly), the tentering and drying operation being the dividing line. When the cloth is dry we refer to the cloth as being in the dry finishing such as steam brushing, shearing, pressing, and so forth.

Tentering and drying also produces many troubles which I will not discuss at the present time. In the shearing operation, uneven shearing will produce a variation in light reflection which gives the impression of shady or streaky goods. The shearing operation, in case some of you are not familiar with it, consists of cutting the fibers from off the surface of the cloth by means of rotating blades. Frequently we shear close to the surface of the cloth; or, we may only take off the long fibers from the surface and we refer to this as "topping." Uneven removal of the fibrous surface will produce shades. This is a mechanical problem in the adjusting of the shear.

The same type of shade will be developed by uneven pressing. The pressing operation consists of flattening the cloth by passing it between metallic surfaces under proper conditions of pressure, moisture and heat. The side having the more pressure will show a higher luster, and the result is that the shade varies. Uneven treatment, therefore, in either shearing or pressing, will produce variations in shade.

In addition to this simple finish which I have outlined, there are many other operations used in the production or development of many different types of finish. One of these operations which I wish to refer to very briefly is known as "raising." Raising consists of disentangling the felted surface of a fabric, thereby producing what is called a nap. It may be interesting for some of you to know that "raising" in woolen finishing requires, first of all, the proper felt foundation. As many of you know, in cotton raising the nap is raised from a more or less loosely twisted thread.

There are two methods of raising. First, we have the old method of gigging. Gigging is carried on by means of teasels, and I have brought a few samples with me. They are not very good specimens, to be sure, but I will pass them around for your examination. If you will notice the peculiar curved point, you will readily realize that it is a very effective raising medium. Teasels on high-grade goods (I don't think there is much question about this) produce as fine a nap as one can possibly obtain. But the cost of this method of raising is high, for the production is low. The more modern method of raising is known as napping. This is a mechanical arrangement by which a series of small rolls, termed workers, and covered with wire having points approximating those of the teasel are brought into contact with the cloth. By changing the surface speed of the workers the raising energy is regulated so as to produce the desired nap.

[At this time samples of many different types of finish were exhibited and their peculiarities discussed at considerable length. The samples consisted of fabrics as napped overcoatings, meltons, bolivias, velours and Whitneys, etc.]

In the finishing of worsted fabrics other operations are brought into use, two of which, namely, singeing and crabbing, I wish to refer to very briefly. Singeing is used in the finishing of close finished worsteds of the lighter types. Serges for men's wear are also frequently singed. Singeing removes the fibrous surface, producing

a closer, sharper twill effect. Uneven singeing will produce shades in the finished fabric, and this is one of the frequent reasons for the production of shady goods. Any hesitation in the forward movement of the cloth means a seared place which may be more or less prominent and which will affect the color.

The next operation, crabbing, is a treatment given most worsteds and all piece dyed worsteds so as to set the fabric and prevent undue shrinkage, wrinkling and the development of felt during the subsequent operations of scouring and coloring. The cloth is passed in its full width through two or three tanks of boiling water, and under proper conditions of tension and pressure the cloth is brought down in width and stretched more or less in its length. The cooling operation which follows sets the fabric.

Crabbing and blow-steaming, which is really part of the crabbing operation because it is often done on the crab, frequently causes serious defects. One of the common defects is known as a water-mark. A water-mark is an uneven reflection of luster from the surface of the cloth due to uneven flattening. This sample of serge (a very coarse serge and one very susceptible to watering) has a series of pronounced water-marks, if you can see them in this light. These water-marks were produced by too much tension during crabbing. Too much pressure on the top rolls in the crab, inefficient steaming, and even cooling will produce the same thing. These marks were produced deliberately as I desired a good example of crab water-marks for purposes of instruction.

Another common defect produced in crabbing is known as "dark ends." Dark ends are caused by too much steaming, or let me say by uneven steaming of the piece from end to end. The end on the inside, that is, the end nearer the steam shell, very frequently gets more steaming and the result is a dark end. Too much cloth on the shell, or too high a steam pressure will produce the same result. Dark sides are also produced by having too much steam on the sides, or rather, by having more steam on the sides than in the center. This may be caused by not placing the cloth centrally over the perforated area of the shell, or having a shell with too narrow a perforated area. These three defects are very frequently produced in the crabbing operation.

Crabbing is also a beneficial treatment for cockled goods. A cockle is an uneven, puckered effect in the cloth caused in many instances by variation in tensions and take-up during weaving. To remove the cockled effect, the cloth must be crabbed under more drastic conditions than if the piece were free from cockles and sufficient tension must be used on the warp to bring the slack portions under tension; the fabric is then set in this position. If the crabbing has not been done satisfactorily the cockles will reassert themselves to a greater or lesser degree during the sponging operation.

Sponging, which is an operation for thoroughly shrinking the cloth and rendering it spot or shower proof, may be done by the immersion method, or by steam blowing. In the former method the cloth is first steamed to destroy the press finish and open the fabric. It is then immersed in cold water, well squeezed and rolled on a shell. The cloth is left on the shell to sweat for a few hours. It is then hung up to dry. This method gives a more thorough shrinkage than steam shrinking.

Steam shrinking consists of winding the cloth on a perforated steam cylinder and blowing steam through the fabric.

Properly sponged cloth will not shrink under the iron. Sponging also brings out many defects covered by the mill finish.

I believe I have trespassed long enough on your time; in fact, I have spoken longer than I expected to. It has been rather difficult to pick out the things that might interest you because there are so many of them, but I have tried to cover the ground in a general way.

Again I thank you for your attention and I thank you, Mr. Chairman and friends, for the privilege of being with you to-night. (Applause.)

Discussion

Chairman Lotte—I am sure we appreciate Professor Stewart's coming all the way from Lowell to speak to us to-night, and I know we all enjoyed listening to him. I know that I did, and I am sure that our friends who are here did also. You could tell that, Professor Stewart, because your talk held their interest, and they are a little bit like a class of boys when they are not interested. (Laughter.)

The meeting is now open for discussion. Professor Stewart has offered to answer any questions that you may ask.

L. S. Hirsch—What type of soap do you recommend for finishing?

Professor Stewart—It varies entirely with the fabric and the finish you are trying to produce.

The two soaps generally used in finishing are palm oil or tallow soap. For long fulling periods requiring a soap of heavy body that will stand up without breaking down for a number of hours (say, five or six, or possibly more), also where we require a very firm, solid felt, tallow soap is really advisable. Tallow soap has the heavier body and better lasting properties. The objection, however, to the use of tallow soap is its lack of solubility, as compared with palm oil soap. It takes much longer and more thorough rinsing in the washer to remove tallow soap, and this is very frequently the reason

for streaks and clouds. If you can obtain the required results with a palm oil soap it will rinse away during washing more readily. Palm oil soap is therefore used in most instances, provided the fabric is not in the mill too long.

The proper body for a fulling soap, by the way, is determined by testing after it has been running in the mill for a short time. The mill is stopped and the cloth squeezed in this manner [indicating] and the soap should flow more or less freely. If it does not flow freely but comes up in a beady condition on the surface, the soap is in a pasty condition and this indicates too heavy a soap body; that is, too many ounces of soap per gallon, or too much tallow and not enough palm oil, and you can correct your body accordingly. Pasty soap, by the way, is a very prolific source of wrinkles, and chafe marks. It also frequently causes streaks and clouds during dyeing, owing to the soap and dirt not being completely removed during the fulling and washing operations.

E. S. Chapin—Where do these teasels come from?

Prof. Stewart—The teasel is grown in northern New York State. It is also imported to quite an extent. I haven't the exact figures in mind regarding the production of the teasel, but they are raised in large quantities.

Mr. Doyle—Is there any way to get the water-marks out of the cloth after they they have once been set in there?

Prof. Stewart—The best way is to prevent them in the next piece. (Laughter.)

I do not desire to give the impression that they cannot be modified, but in crabbing the water-marks are usually rather small. This sample shows a pronounced water-mark, if you can see it in this light. The water-mark is caused by uneven flattening and consequently uneven reflection of light. A light milling or fulling will break up the surface. Pressing will also modify the mark. The idea is to break up the surface. A washing, a light soaping, the use of an open width washer all help to break up the surface.

Some goods water very readily. Of course, in cottons and silks, about which you will hear later, some beautiful water effects are deliberately produced.

Dr. H. F. Herrmann—Professor Stewart, the chemicals that are used in the wet finishing—chemicals, soaps and oils—I understand are mostly removed. The dry finishing is purely mechanical—

Prof. Stewart—Yes.

Dr. Herrmann—In many other fabrics—cottons, silks, artificial silks—there are substances added in the form of gelatine, starch, oil, or things like that. To what extent do these enter into the finishing of woolens?

Prof. Stewart—Very little. It is practically not worth considering. In some very lightweight worsted goods made from very fine worsted yarns, we do sometimes size them with a little glucose, or glue to give a little extra crispness to the fabric.

In low grade woolen goods, if the cloth lacks firmness and the required clothy feeling, it is sometimes stiffened with glue, starch, etc.

Chairman Lotte—You use tallow soap?

Prof. Stewart—Yes.

Chairman Lotte—Do most of the wool mills treat the water for washing the wool?

Prof. Stewart—Only in sections where the water is very hard.

Chairman Lotte—Are there any other questions you would like to ask Professor Stewart? I am sure we enjoyed hearing from you, Professor. I will be glad to entertain a motion thanking the Professor for coming here to talk to us.

. . . Upon motion regularly made and seconded, it was unanimously voted that an expression of thanks and appreciation be extended to Professor Stewart. . . .

Chairman Lotte—Professor Stewart, we certainly appreciate your having come this great distance to talk to us to-night, and I am sure we all enjoyed it very much. I know it has been profitable to me, although I know very little about wool.

We are glad to have with us to-night Mr. John M. Palmer, of Borne, Scrymser Company, who will speak to us on the subject of the finishing of cotton. Mr. Palmer! (Applause.)

Cotton Finishing and Materials

By John M. Palmer

Borne, Scrymser Company

I feel honored in being asked to speak a few words this evening and I ask your indulgence even though you may not find my remarks in entire accord with your views. I do not anticipate being able to offer any entirely new and constructive thoughts. You may, however, find my remarks timely, and if to this extent my efforts are not misplaced I shall feel quite contented.

The subject of the finishing of cotton, it is needless to emphasize, is an important phase of the cotton industry, to a degree possibly more so to-day than at any previous time. Especially is this true because so much is being attempted in many instances under hectic market conditions. All about us I see evidence of this, and few men, it is safe to say, believe the years have not changed practices generally; although it oftentimes appears that very antiquated ways and means exist, and we are often forced to marvel at the results obtained under such handicaps.

My acquaintance with cotton finishing is confined more to the materials employed rather than to the various machine operations. This is owing to the fact that for several years I have given a vast amount of time to the

study of finishing materials. I, therefore, have these in mind to-night principally.

The mechanical processes of treatments and the materials used have a bearing on results (as is well known) which is so important that each should be given separate consideration. This leads naturally to an analysis of the mechanical principles and the physical and chemical processes involved.

In my few moments of talking very little of the subject can be covered along the lines of specific data to give one result or another with such a broad subject. I have it therefore in mind to offer only suggestions which may lead to constructive consideration, and to ask a question or several questions pertaining to the selection of finishing materials of every sort and the use of these. I do not have in mind any class in particular nor even a few, but all.

That the importance of the results needs no emphasis will generally be agreed upon. On the other hand, as to the relative merits of materials and methods I have found a vast disagreement, and it seems to me more than should exist. I am inclined in the main to except dyes and dye materials and to add that great improvements in this field are generally acknowledged, so much has been accomplished in the last decade.

The use of dye materials continues to be standardized, but this can be said of only a few finishing materials, although it does apply very pronouncedly to several. Therefore the application of those not standardized to any real extent is carried out in a more or less hit or miss fashion.

I do not have in mind to urge standardization of finishing materials but to suggest the value to be derived from a better understanding of the properties of those which have to a marked degree been neglected, the substances being looked upon as necessary evils and many times not imaginary evils.

It is many times of the utmost assistance, although not imperative, that a man be a chemist, that he have an extensive chemical training, or that he spend years in the study of products and materials to understand the practical values or even the technical qualities and best methods of application of them. Each man cannot do everything and he would, of course, not be fitted even if his time would permit; but if we make it a point to determine what is known and use our common sense we can very often have a full measure of advantage for our own benefit by learning what has been the experience of others and gain by their investment. Enormous investments, as is well known, have been and are being made by the manufacturers of dyers' materials. I mention this by contrast, although investments of size, to a lesser extent, have been and are being made by the manufacturers of finishing materials, in an effort to know more of the theory and the best practice concerning finishing substances. This is true in the case of many finishing organizations as well as in the case of individuals.

In any line of manufacture segregation of investments must be made; usually there are proportionate to expenditures necessary unless they directly affect quantity production.

I do not question the prudence of this state of affairs, but I am firmly convinced that those responsible for or interested in finishing results on cotton materials should make it a duty to be more thoroughly interested, to get at reasons why starches and their derivatives, gums, waxes, fats, oils, chemicals, etc., are necessary. They should learn this, not only from hearsay, but from a theoretical as well as a practical viewpoint.

If this is not worth while then why is it a fact that such a variation of opinion exists? Why do different finishers in different plants get at the results as near as possible required, with different materials or similar ones used in different ways, and different finishers under the same plant conditions be unable to produce the same results and at times not be able to control a variation of these, and all at varying costs? Also, is it easier for two men to agree on a subject of which they have a thorough knowledge than when the knowledge of one or both is questionable? Is it not usually profitable to eliminate unwarranted prejudice and are there good reasons that this should exist? This last condition, I believe, is surely unreasonable and to me ridiculous; still one can only hope to partly eliminate such a condition.

To work toward this end it would seem to me that the sellers of finishing materials should strive to have a better knowledge of their offerings and be able to define what they have, theoretically and practically, and what should and what should not be expected in results. The user should demand to know these things and to be open for his own advantage, that alone to consider the seller's investments along with his investments.

There are few men who do not need the help of their fellows, yet I wonder how much of the time most of us are frank enough with ourselves and others to admit it. I am not excluding myself for I do not deserve to be excluded.

I thank you, gentlemen.

Chairman Lotte—Mr. Palmer has offered to answer any questions that you might ask. The meeting is now open for discussion.

I was going to say it is pretty hard for a finisher not to have some prejudice because he has to suit a whole lot of people and a great many of them don't know just what they want themselves.

Mr. Palmer—He should search for all the help he

can get. He shouldn't be afraid to show what he doesn't know in order to gain something.

Chairman Lotte—I am sure a great many of us have finished the same goods for two or three different houses, and we know how hard it is to get one man to take what another man will take. I was speaking to a hosiery man the other day. He was telling me about two firms in Reading who finish hosiery. One, he told me, scroops theirs and the other doesn't, and he said they both went into the same market and some of them went through the same wholesale house.

Mr. Palmer—I might say that with the great part of hosiery being manufactured to-day, especially hosiery for women's wear, if something wasn't done to it, it would be a pretty hard proposition to get the hose on the first time [laughter] as there is so little to them.

Chairman Lotte—I believe one of the troubles of the finisher is in being able to find out what his trade will accept. Isn't that true?

Mr. Palmer—Yes, that is true.

Chairman Lotte—That is because the buyer quite often wants something that looks nice to him. He doesn't ask whether it has wearing qualities, as long as it is something that is pleasing to the eye. Of course, I believe the public is becoming educated more and more each day to taking finished goods for their wearing qualities rather than for appearance alone.

Mr. Palmer—Yes, but I think really what they are getting is appearance rather than wearing qualities.

Chairman Lotte—I don't agree with that as far as cotton and silk goods are concerned, because I think the public are coming to pay more attention to wearing qualities and understanding better how to handle them.

Are there any other questions that you would like to ask Mr. Palmer? If not, Mr. Palmer, I wish to express to you our great appreciation for your very enlightening talk to us this evening.

We will go right on with the program and take up the subject of silk finishing which will be handled by Victor H. Berman, president of the Onyx Oil & Chemical Company. Mr. Berman! (Applause.)

The Finishing of Silks

By Victor H. Berman

President, Onyx Oil & Chemical Company

In considering the subject of silk finishing, let me first explain some of the reasons why silk is finished.

To begin with, as the word "finished" implies, the silk fabric would not be complete without the finish, for it is this process which gives to the silk that "hand" or "feel," be it mellow or harsh, as the requirements call for. This process also gives the cloth that "draping" or "clinging" effect, which the trade demands.

A scientifically prepared "pure dye finish" will impart to the silk fabric approximately 20 per cent weight, without harmful effect to the fiber; in fact, on the contrary, it will strengthen it, without impairing the "luster" and "mellowness."

About fifteen years ago the silk manufacturer produced silk cloth of such a good quality that it was only necessary to finish the same with an ordinary "sizing." As conditions in the trade changed, competition became more keen, and with the advent of scientifically prepared finishes, the silk manufacturer found that he could leave out a few threads of silk, and still have (with the aid of finish) a salable piece of merchandise. Of course, like all other good things, advantage was taken of the situation, and instead of using the full amount of silk, the manufacturer found that by leaving out from 10 to 25 per cent silk and finishing with the up-to-date process, he obtained a more salable fabric.

Practically every type of silk piece goods is finished, and it is conceded that "the finish sells the goods."

Many are the demands made upon the silk finisher, as, for instance, "high luster," "dullness," "softness," "harshness," "pebble," "scroop," "shrinkage," etc.

Most silk finishers have artistic talents, and their profession is really an art. They must be possessed of a keen sense of feel, sight and good judgment.

Quite often the finisher is blamed for some of the faults which occur prior to finishing, and over which he has no control. Finishing really commences with the "boil-off," for it is through a faulty manipulation of this process that many defects are later found. Improper "boil-off" is a chief cause of "chafe marks," "streaks," etc. In the dyeing, too, care must be exercised to avoid a subsequent occurrence of these evils.

The following is a brief description of the process of finishing silk piece goods:

After the silk comes from the dyehouse it is dried, framed, run through a quetsch or mangle, then run over a frame where a three-roll quetsch is used, or through a dry box in the case of a two-roll mangle. The fabric is then calendered, or run over the button-breaker. Some types of silk, such as radiums, are run over the palmer. The silk is then inspected, after which it is folded and packed.

The "quetsch" or "mangle" consists of a gutter containing a solution of the prepared finish. In this a roller revolves, above which and pressing on same is a second and sometimes a third roller. The silk passes through these rollers and becomes impregnated with the finish solution, the excess solution dropping back into the gutter.

The calender is used to produce a mellow effect and also a high luster when desired. It consists of three rollers or cylinders placed in a suitable framing, one over the other, being gear driven. The middle roller is of highly polished steel, and the other two are covered with

compressed paper. The steel roller is so constructed that it can be heated by steam when necessary. Pressure is placed on the cylinders by means of a system of weighted levers and is regulated by giving so many "nips" until the required feel or hand is obtained. The cylinders should be kept clean, for if any grit or dirt is left thereon, marks or streaks will be found on the silk.

The "button-breaker" consists of two series of wooden rollers with brass knobs. The distance of these series may be regulated to produce various amounts of tension. The fabric passes through these rolls as they turn in opposite directions. As its name implies, it is used to "break down" or soften.

The palmer consists of a very large steel drum and one small drum, and produces far greater pressure than that obtained by the calender. To this machine is invariably attached a two-roll mangle, also a felt blanket cloth which helps to attain the proper width of silk, and dries the finish and incidentally helps to penetrate the same.

The making of silk finishing compounds has passed from the stage of ordinary mixtures, hit-or-miss combinations of anything that would produce some result, regardless of its eventual effect on the silk, or its permanency, until to-day it is a science involving all the deep principles of chemistry. Mixtures were formerly made without knowledge of what the actual result would be, the only aim being to get as good a result as possible, so that the silk would pass inspection before being shipped. It is easy to see that such effects were not only unsatisfactory, but wasteful and even harmful to the fabric.

This state of affairs led to a thorough scientific study of the different finishing materials, their properties and application. A great number of the old approved theories were proven wrong, new uses for old materials were found, and new products before unknown were found to be of most value.

Mills that employ the services of a chemist have found that the expense incurred in both research work and installation of equipment is not warranted by the limited volume of finishing materials used, and that the services of the chemist are used to better advantage in other processes which afford a greater saving.

There is no longer any reason for groping in the dark, trying to obtain the desired results. It is a subject based on fundamental truths obtained only through long research and investigation.

The reliable manufacturer of finish well knows the peculiar characteristics of the various substances, and can blend them to produce a well-defined physical and chemical product. Such a manufacturer has fully equipped research laboratories in charge of expert chemists, a factor essential for the production of accurate results, and consequently can produce definite compounds of definite properties which may be used for the production of definite results.

The finisher in a plant has neither time, equipment, nor training with which to produce the proper finishing materials, hence, in appreciation of the worth of the scientific product, the use of the properly made compounds has almost completely replaced the rule-of-thumb, poorly made, wasteful and unsatisfactory mixtures that can be the only result of textile mill production.

It is just as ridiculous to expect a finisher to make "finish," as it is to ask a dyer to manufacture his own dyestuff.

Home-made finish is an expensive experiment.

When the up-to-date finisher wishes to obtain a certain result, he consults the manufacturer of these products who can supply exactly what he needs.

The finisher can never advance from a state of inefficiency until he takes advantage of the experience of those who have made a scientific study of his problems and buys his products, instead of wasting his employer's time in attempting to do something he cannot possibly accomplish.

I have with me a few specimen samples of silk fabrics finished by some of the representative silk finishers, showing the results produced by the Onyx process. If you care to look at them you may help yourselves.

Thank you. (Applause.)

Discussion

Chairman Lotte—I am sure Mr. Berman is ready to answer any questions you might like to ask him.

Mr. Chapin—What is the Onyx process?

Mr. Berman—That is our special method of using certain kinds of scientifically prepared finishes. We give certain formulas to the finishers for applying them. That is what we consider the Onyx process.

Mr. Herrmann—May I ask how much weight you add to a silk fabric without materially influencing its appearance?

Mr. Berman—I figure that you can get practically the whole of the boil-off loss back on the silk, especially crepe de Chine. In other words, when the silk is boiled off there is approximately between 20 and 25 per cent loss in weight. You can get back about 20 per cent of that weight with the Onyx process.

Mr. Herrmann—Can you apply that to hosiery?

Mr. Berman—Yes, we have special finishes for hosiery, for weight and luster.

Mr. Herrmann—It will practically restore them to paring?

Mr. Berman—Yes.

Chairman Lotte—You claim you can bring that back—

Mr. Berman—Not on all fabrics, crepe de Chine being

a big item in the silk trade, I had that in mind. That is the biggest item right now.

Chairman Lotte—When it lies awhile, it is likely to crease or mark off, isn't it?

Mr. Berman—No. If the finish is overdone or if too much oil is used, that is apt to happen, or if an overdose of finish is given it might cause that defect.

Chairman Lotte—If you add finish, you have to add oil, don't you?

Mr. Berman—Oh, yes, to keep pliable, but there is a limit to that, of course. You have to go to a certain limit. When you reach that limit, something will happen if you overdo it.

Chairman Lotte—In the course of your paper you said something about a good bit being charged to the finisher that should be charged to the boil-off and so on. I agree with you on that. In fact, I would go a little bit further and ask you if you don't think the selection of silk, the manufacture, the throwing, and so on, is oftentimes blamed on the finisher. We find quite often that the finisher has trouble which is due to the preparing of the silk fiber and to the weaving and manufacturing as well as to the boil-off, dyeing, and so on.

Mr. Berman—Oh, yes, I agree with you on that. Quite a few troubles can be traced to that source.

Chairman Lotte—We have irregular twists which come from the manufacturer which they ask us to stretch out sufficiently in order to hide them, and sometimes, too, I presume that you add a little extra finish in order to cover weaving streaks.

Mr. Berman—Yes, we try to do that.

Chairman Lotte—So that those things start, really, with the manufacturer. I mentioned that because I felt that some of our manufacturers might read this and think that all of the troubles start with the boil-off. I think a good many of them start a little ahead of it.

I didn't intend to monopolize the discussion regarding silk. I will be glad if anyone else has any questions, if they will ask them.

Louis J. Dogin—Mr. Berman, can you suggest any finish that would finish and add weight to rayon or artificial silk?

Mr. Berman—I am not really here for the purpose of advertising my company, but I don't mind saying that we have succeeded in doing that. We have succeeded in producing something that will give up to 55 per cent weight on the artificial silk cloth, and the cloth will still retain its elasticity and pliability. In fact, we are patenting the process right now.

Mr. Dogin—Will you give me a brief description of the process?

Mr. Berman—I couldn't do that because we just applied for the patent and I wouldn't care to divulge any of the secrets.

Chairman Lotte—Do you mean it will add 55 per cent of the weight on rayon?

Mr. Berman—Yes, in fact, we got over that. When we went above 55 per cent the goods became too stiff and unsalable, but I have seen a piece of fabric that had 55 per cent of weight on it and which had a wonderful appearance.

Chairman Lotte—You only do that in the knit goods, not in the skeins, don't you?

Mr. Berman—No. You will recall I was at your plant and made some experiments there, and I got about 18 per cent, but the process wasn't just right at that time. It has been improved on since then.

Mr. Herrmann—Do these finishes withstand washing to any extent?

Mr. Berman—Yes, they will stand a few washings without losing much weight. I would say that two or three good hot washings would probably make the goods lose about 5 per cent of weight, but ordinary washings don't affect them much.

Mr. Herrmann—Will they retain the "hand" or "feel" on such light things as underwear silks?

Mr. Berman—Yes. Take these fabrics here; these are specimens from probably half a dozen representative firms throughout the country. I was in Easton the other day and I got some samples over there; most of them, however, came from Paterson. It might be a good idea for you to examine them and see what you think of them.

Chairman Lotte—You made a statement in your paper that formerly manufacturers used eight-thread fabric whereas now they use two to four thread fabric. In silks, that is, dress goods, I don't know of many cases where twenty years ago they used to use eight threads to any extent. They used mostly two, three and four, and they may have doubled them. In any event, I don't know of any case where they are using two or four thread to-day where they used previously eight-thread fabric.

Mr. Berman—I recall having seen fifteen years ago a fabric that had nothing but real silk in it and no finish, and if I remember correctly it was about an eight-thread silk, although I am not ready to argue the point. But you will agree with me that the fabric put out fifteen years ago was by far superior to the fabric being put out to-day by pure silk weavers—I mean in regard to quality.

Chairman Lotte—I differ with you, because we are using less weighting to-day than we did then. (Laughter.) In those days they made principally taffetas, peau de soies, and lines like that that were quite heavily weighted.

Mr. Berman—When crepe de Chines first came out on the market—how many years ago was that?

Chairman Lotte—They are out now about twenty years.

Mr. Berman—That is what I have in mind.

Chairman Lotte—Crepe de Chine was not the fabric

that was used principally for dress goods at that time. Crepe de Chines were used to some extent, but not to the extent that they are used to-day, and you couldn't to-day take a two-thread crepe de Chine and use it in place of an eight-thread crepe de Chine that was used twenty years ago, no matter how heavily you weighted. Twenty years ago the crepe de Chines were used more for trimming, on the order of chiffons, and so on. That has been my experience. If you will recall, in those days they were made around twenty-seven inches; they were all narrow fabrics; to-day they are made forty and forty-one, for dress goods. As I say, in those days they were used principally for trimmings, and chiffons were in the game then. If you will recall, chiffons were weighted heavier in those days than they are weighted to-day.

Mr. Berman—It is merely a matter of opinion on that, I think.

Chairman Lotte—You can prove it, Mr. Berman, because the French georgettes, or rather, the French chiffons that were out before the war were weighted much heavier than our crepe de Chines are to-day. Of course, before that we had no weighted crepe de Chines—I will agree with you there. Crepe de Chines were not used for dress goods then to the extent that they are to-day.

Mr. Berman—I agree with you on that.

Mr. Mockley—Have you some kind of finish that will remove chafe marks?

Mr. Berman—Yes, we have been selling a product of that kind for some time.

Mr. Mockley—That means you will cover a large amount of chafe marks, or only a small part?

Mr. Berman—The ordinary chafe mark can be eradicated with a chafe eradicator solution, if done properly, and there are quite a few concerns in Paterson doing that.

There is another method of eliminating those marks by the use of a felt brush. Some of the finishers are using a felt brush with a solution to cover some of the chafe marks, while others treat the silk with this chafe eradicator solution.

Mr. Mockley—Do you use that chafe eradicator with finish?

Mr. Berman—It can be used alone with water, or with finish.

Chairman Lotte—If you have a series of chafe marks I presume you rub.

Mr. Berman—Yes. With the really bad chafe marks, the best method to use is the felt brush with a solution, not necessarily our solution, but some ordinary mixture used for that purpose, like carbon tetrachloride, mineral oil, or something like that.

Chairman Lotte—Do you have any other questions?

Mr. Jackson—Can that finish on artificial silk that you say is going to add all that weight to the fabric after it is woven or knitted be used on the skein or yarn?

Mr. Berman—Yes, we are applying that on the yarn, too.

Mr. Jackson—And does that give a stiffening effect to the yarn for weaving purposes?

Mr. Berman—No, we have eliminated the stiffness purposely with a certain kind of softener in conjunction with the finish that we use.

Mr. Jackson—I often receive requests for something that will give a stiffening effect to the artificial yarn for the purpose of aiding the weaving, so that all the fuzziness of the yarn is laid down and so that an even effect is given to the yarn. Does that finish of yours produce that effect?

Mr. Berman—Not that particular finish, but we have something that will do that particular work. This particular finish that I spoke of before has a mellow effect; it is not hard. You asked for something that would give a hard or stiffening effect on the fiber. That can be done with an artificial silk sizer which is not this other product that I spoke of.

Mr. Howes—Mr. Chairman, I don't think this question is particularly technical; it is more of a trade proposition, but possibly many of you have seen the discussion which has been carried on by the Dry Goods Economist for the past month. It started out with a broadside directed against silk weighting entirely. The first article took the position that apparently all silk weighting is harmful. That position has since been refuted, notably by Mr. Blum of the United Piece Dye Works, and by several other correspondents. Apparently most of the retailers who have written in have the impression that any and all silk weighting is harmful to the fabric. The chemists and technical men of the silk manufacturers have taken the opposite view.

It might be interesting to know what some of the people here think about that subject, as to whether silk weighting as a general proposition is harmful, or whether it is a question as to how much weighting is harmful; that is, whether a certain percentage is harmful and a lower percentage isn't, or whether it is purely a matter of how that weighting is applied.

Chairman Lotte—Is there anyone who wants to answer that question? I think that it depends entirely on how you apply it, or how much you apply, because even if we put on too much of the Onyx finish it would get stiff. If you add too much finish to any piece of goods it is harmful.

There are a great many cases where weighting of silk fabrics is beneficial. There are a great many cases where silk will not only wear better but hang better and keep its shape better if it is weighted. It is a matter, we feel, of applying it to the proper place and knowing

where to weight, how to weight, and what good it will do. Not only that, but one of the things that the European manufacturer has studied and which we are studying here to-day is how to manufacture the goods so that they will stand the weighting properly. The time to provide for that is at the start of the construction of the goods. There have been mistakes made by some of our people constructing goods for pure dye and then taking a piece of that goods and weighting it in order to see whether it will make a better piece of goods or whether they can get more money for it. That piece of goods is not constructed for weighting, so it is not a satisfactory piece of goods. A great many of our people are to-day studying goods to see whether it is suitable for weighting, and in that case they will get better goods quite often than they would if they just weighted pure dyed goods; it will wear better, hang better and suit the present fashions better. Of course, that is a thing that we can go too far into, but as a general rule people are not going too far and our American manufacturers are more careful in that respect than foreign manufacturers.

There are reasons for that. In the first place, we can't take as poor a quality of silk in this country and weave it as economically as they can in Europe because the labor is so much cheaper there and they can spend more time in weaving it. We don't take quite as fine a thread here, I mean as fine in denier, to weave because our labor is too expensive to weave it. Our silk must wind better in this country in the thread than it does over there because it costs us more to wind it, and the heavier your thread is the less you will weight it in order to get results.

It is from an economical standpoint that our American manufacturers do not weight as heavily as either the French or Swiss or Italian manufacturers. Economical conditions point here toward our American manufacturers not going too far in the matter of weighting, and now they are constructing goods so that they will be suitable for weighting purposes.

In order to weight properly, a piece of goods should not be too tightly woven. The looser goods weight better than the tightly woven goods. If a piece of goods is tightly woven, there is no reason to weight it because you have the silk pretty well packed in. It is also true that even a pure dyed piece of goods tightly woven will not wear as well as a loosely woven piece of goods because the fibers themselves cut each other.

I am trying to answer you from the silk dyer's point of view, and you will have noticed that Mr. Blum has answered the question pretty well along those lines.

So it is a matter for our technical men or our chemists to study and decide what is best. We are not weighting our piece dye goods to-day as heavily as we weighted our skein dye formerly, and our weaves and conditions are better than even our skein dye goods were formerly.

A few years ago one of the manufacturers tried to make a pure dye silk which he put out under a certain brand; he tried to pack the pure dye silk in there just as tight as he could. Then he went back to his dyer and told him that that silk cut and said to him, "You didn't give me a pure dye."

The dyer said, "We certainly did."

When they looked at the goods they found that the fault was due to the construction of the goods. The manufacturer had put so much silk in there that the fibers cut when they were folded.

So my conclusion is that the breaking of goods is as much due to construction as it is to weighting and finishing.

Mr. Howes—Is it a fact that the weighting process has changed in recent years from what was possibly a plating process to a process which absorbs the metal salt directly into the fiber?

Chairman Lotte—I don't think that it has changed from what you would call a "plating process," but I will say this: that the dyers understand weighting to-day in that they are more careful to neutralize every salt, so that there is very little to attack the fiber.

I don't know whether that answers your question or not, because it is quite a question as to just how that weighting is held in suspension on the fiber. There is quite a little difference of opinion as to whether it is inside or outside, or whether it is a coating or not. But it does seem to be separate from the fiber because of the fact that you can remove it.

Mr. Chapin—I am very glad Mr. Howes brought that question up because I thought at the December meeting in Philadelphia a number of misstatements were made with regard to the possibility of weighting silk. I mean it was the general inference that the weighting of silk was harmful.

One can add very little to what Mr. Lotte has said, but many years ago I studied quite thoroughly into this question of weighting of silk for black dyeing, and I can say from what I remember of that study that when this was done properly there was a nourishing effect and a strengthening effect given to the fiber and as a result the fabric resisted wear and tear much better than the unweighted black fabric.

So far as the improvement in methods of dyeing is concerned (I speak merely of the matter of black dyed silk), in the last twenty years that process was practically revolutionized with the use of logwood extract. The amount of scientific work that has been done on that has greatly improved the process.

There was a time, many years ago, when you would have five pounds of weighting perhaps to one of silk. I remember at one time, about twenty years ago, I weighted up something 300 per cent. That was a joke, of course.

and that is not the practice at present. The practice that is followed now, as I understand it, is to have much less weighting.

Dr. O. R. Flynn—I would like to ask Mr. Berman a question.

Quite some time ago, a question was referred to me by a reputable publication about the use of casein. Some manufacturer of this product wanted to know to what extent it was used in the textile trade, and I thought this might be a good time to ask that question. Do you know to what extent casein is used in the finishing of silks, if at all?

Mr. Berman—It is used, but to a very small extent. We use it in our several processes, but not to a very great extent.

Dr. Flynn—It is not largely used in silk, then?

Mr. Berman—No, it is used very little.

Chairman Lotte—I might say in reply to Mr. Chapin, I don't know whether he remembers the shawls his grandmother used to wear with the black fringes around them. Those shawls haven't been in style for the last fifty or sixty years, but I will say they were weighted 800 per cent. (Laughter.)

G. C. Rudolph—I would like to ask Mr. Berman what is the object of weighting artificial silk.

Mr. Berman—To give it better draping qualities. That That is one thing it will do. Then, in some instances, artificial silk is sold by weight and it would be to the advantage of the seller to have more weight in the artificial silk. (Laughter.) Whether it is real artificial silk or chemical probably doesn't make any difference.

Mr. Rudolph—But don't you think that artificial silk itself is too heavy? Don't you think that the goods produced purely from artificial silk are entirely too heavy?

Mr. Berman—Some qualities are and some are not. Some are very, very thin and light. It all depends on the denier. There are very light qualities of artificial silk, and there are heavier qualities.

Mr. Rudolph—Still, oftentimes they are heavier than real silk, even the lighter qualities of artificial silk.

Mr. Berman—In selling artificial silk, it isn't a question of comparing it with pure silk, you see.

Mr. Rudolph—I can't see the purpose of it because the finished goods aren't sold on the basis of weight; they are sold by measurements, by yards, and so on.

Mr. Berman—No, there are some qualities that are actually sold by weight.

Mr. Jackson—Would your finish, Mr. Berman, help the tensile strength of the artificial silk or the wearing quality of the artificial silk?

Mr. Berman—It will strengthen it, and it will not in any way make the fiber more tender.

Chairman Lotte—Are there any other questions you would like to ask Mr. Berman?

J. J. Sokolinski—Did I understand that Dr. Flynn asked about casein finish on silk?

Dr. Flynn—I merely asked that for information.

Mr. Sokolinski—I might say offhand that we all know it takes an alkali to dissolve casein, but there is a neutral liquid casein on the market that is used in the finishing of silk. We are all familiar with casein cold creams. They are very good to use, but they aren't very stable. For that reason, casein mixtures aren't really practicable, I would say offhand. If they are stored and become dampened, or if they haven't the proper preservatives in them, they are liable to become rancid, and if they haven't something in them to make them insoluble—that is, if there isn't a proper softener in there—they will dry out stiff.

Dr. Flynn—We use casein for calico printing, to remove the pigments, an ammoniacal solution of casein.

Mr. Sokolinski—Yes, but the ammonia goes off.

Dr. Flynn—We usually use a formaldehdye bisulphide.

Mr. Sokolinski—That renders the casein insoluble. The steam dries off the ammonia and the formaldehdye renders it an insoluble casein.

Mr. Berman—I would differ with you on that, because we have done considerable research work on casein and our chemists have succeeded in overcoming that difficulty In other words, they have discovered a process whereby they can use casein to advantage in silk finishing compounds. Of course, that is more or less of a secret, you know, like all the rest of the products. (Laughter.)

Mr. Sokolinski—I don't wish to advertise, but we have a neutral liquid casein that is a patented article; it isn't alkaline or acid; it is neutral. I just wanted to tell you that.

Mr. Chapin—Coming back to the question of weighting, you can't weight up to three hundred per cent using tin, can you?

Chairman Lotte—When I was talking about weighting 300 per cent I had in mind what we dyers called "forty-eight per cent," which would only be 200 per cent weighting. I want to make that correction, because the Europeans use the weight two hundred while we in this country refer to it in ounce weights, which would be forty-eight ounces, which would be only 200 per cent, not 300. And that is possible without tin, or with tin, on blacks.

Are there any other questions?

C. F. Schaumann—I would like to ask Mr. Berman what is used in weighting artificial silk.

Mr. Berman—I am sorry but I can't tell that; that is another trade secret. (Laughter.)

Chairman Lotte—As Mr. Berman is having this patented, you will probably in the near future be able to get the patent papers for fifteen cents, or a quarter. (Laughter.)

Are there any other questions? If not, a motion to

adjourn is in order. Before adjourning, however, I think it would be well if we extended a rising vote of thanks to Mr. Berman and the former speakers.

. . . Such a vote was accordingly given and thereafter upon motion regularly made and seconded it was voted to adjourn the meeting. The meeting adjourned at 10.10 P. M.

Applicants for Membership

Active

Akerstrom, A. R., salesman and demonstrator, National Aniline & Chemical Company, Charlotte, N. C. Sponsors: A. J. Jorgensen and C. H. Stone.

Backup, Elliott, chemist, Burlington Mills, Winooski, Vt. Sponsors: F. M. Bonnett and H. J. Stulz.

Glenn, H. T., dyer, C. & M. Hosiery Mills, Oxford, N. C. Sponsors: H. L. Seiver and H. W. Ormand.

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Weinz, W. E., assistant manager, Grasselli Dyestuff Corporation, Philadelphia, Pa. Sponsors: H. E. Tillson and B. K. Archer.

Junior

Seedge, W. T., dyer, Smith Hosiery Mills, Chattanooga, Tenn. H. L. Siever and H. N. Ormand.

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ASSOCIATION BADGES

The lapel button badge illustrated herewith is worn by members of the American Association of Textile Chemists and Colorists.

The three "rings" are enameled in red, yellow and blue, respectively, and the initials and border are brought out in gold. The general effect is exceedingly attractive.

Badges may be secured at $1.50 each by addressing the Secretary.

WALTER E. HADLEY,
5 Mountain Avenue,
Maplewood, N. J.

AMERICAN
DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

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MORE ANENT COMPETITION

IN a recent issue of The REPORTER we published an editorial, entitled "Plain Talk on Competition," which seems to have aroused more than ordinary interest among dyestuff manufacturers. A number of comments, both verbal and written, have come to us, practically all of which indorse in a general way our statement that it is high time domestic manufacturers gave serious thought to ways and means of minimizing the destructive competition now prevalent in the dyestuff market.

While many of these comments are simply in the nature of indorsements of our remarks, a few express views of more than ordinary interest and are, therefore, published herewith with the writers' consent.

A letter from A. Klipstein & Co., signed by J. L. Schroeder, says in part:

> Your recent editorial entitled "Plain Talk on Competition" has just been brought to my attention, and I wish to take this opportunity of indorsing what you say therein. Although our business is by no means confined to dyestuffs, we find the price competition existing in this field considerably more bitter than in other fields which we cover.
>
> It is the writer's personal opinion that competition based on progressive reduction of prices to a point which is in many cases below the actual cost of production serves no good purpose for anyone. Even consumers complain of the fact that it is difficult for them to arrive at proper costs for their finished products because of the constantly changing prices of dyestuffs. In most cases these consumers would be perfectly willing to pay higher prices than they are now paying providing they could be assured that their competitors were paying the same prices which they pay.
>
> The basis of this trouble is, of course, great potential overproduction. By some means or other the production of dyestuffs in this country must be reduced to a point commensurate with the demand if anything like stable prices is to be established. How this can best be accomplished is a problem for the dyestuff manufacturers themselves to work out, but it would seem to the writer that there ought to be food for thought in your suggestion that many of the manufacturers now making competing lines could merge their activities to mutual advantage.

Alfred F. Lichtenstein, president of the Ciba Company, Inc., deplores the fact that American manufacturers have not found it possible to combine their efforts at an earlier date. The major portion of his letter follows:

> It is a well-known fact that in union there is strength, and also a well-known state of affairs in the dyestuff business of this country that the competition in those products that are readily competitive approaches the danger line. The remark which you make that it is up to some of the smaller people to make concessions in order to be able to exist in the future, I fully agree with, and if these concessions are not made now they most likely will never have the opportunity of making them.
>
> You are quite right in saying that the possibility exists for a merger of the manufacturing and sales efforts, which would increase efficiency and decrease costs, but it cannot be attempted in a half-hearted way, and will require concessions from all concerned.
>
> That the Community of Interest of the Germans is the first one to show us the way is rather to be deplored, as the opportunity has stood open to a number of other groups for quite a long period, and now the Germans will have to be imitated.
>
> It is not agreeable to have to lose one's identity, but occasionally it is the only way possible. If a solid front is to be presented to the greatest competition that the American manufacturers will have to meet, it will be essential for many of us to make a personal sacrifice for the general good.

A. H. Pierce, sales manager of the Grasselli Dyestuff Corporation, admits the necessity of some constructive action regarding dyestuff competition, but he is apparently somewhat pessimistic in regard to the possibility of any general co-operative movement. He says:

> I have read your editorial "Plain Talk on Competition." Everything that you say is perfectly true. The solution of the difficulty as regards competition among American manufacturers is still, unfortunately, far off, as there is no way of fixing prices, either in practice or in theory, without conflicting with the Federal laws, and any step in this direction, no matter how indirect, would certainly result in difficulties with the Government.
>
> In my opinion, there is no one manufacturer in this country to-day who would not welcome some relief from the present disastrous situation in regard to prices, provided that this relief might be accomplished in an equitable and legal way.
>
> It is my sincere hope that the article which you

have written will accomplish its purpose in bringing the manufacturers of colors in this country to a reasonable attitude in regard to the absurd prices that are being indiscriminately quoted to the detriment of the industry.

From the foregoing typical comments it will be seen that there is an apparent unanimity among dyestuff manufacturers and dealers as to the desirability of stabilizing prices and limiting sources of supply. It is equally evident, however, that no one has anything very definite to offer in the way of constructive action.

As we stated in our original editorial, the problem is unquestionably a most difficult one, but the dyestuff industry as it is is in no worse state in this connection than the steel and other industries have been in times past. We do not for a moment believe that the American dyestuff manufacturing industry can be destroyed by either foreign or internal competition. We do believe, however, that something radical will have to be done as regards domestic conditions, and that it is the part of wisdom for all factors in the industry to give the matter serious consideration with a view to taking some constructive action before actual necessity compels. One is in a far better position to negotiate a truce while still in possession of some of the munitions of war than he will be if he delays making overtures until the last shot in his magazine has been fired.

THE DYESTUFF INDUSTRY AND THE CHEMICAL EXPOSITION

A TRADE item regarding the exhibit of the British chemical industry at the next Wembly Exhibition states: "The individual dyestuff makers will not each have their own display; instead there will be a large combined exhibit of very striking character. It will show not only the immense variety of articles into which color enters, but also what beautiful effects can be obtained by the use of dyestuffs made in this country."

This appears to us to offer a practical suggestion that our own manufacturers might profitably adopt in connection with the coming Tenth Exposition of Chemical Industries in the Grand Central Palace.

Although considerations of actual business involved may provide a decided stimulus for representation at the chemical show, the fact should be stressed that industrial exhibitions are primarily characterized by their undoubted educational influence upon the public. Because of the basic nature of the science of chemistry, because of the keystone position of our chemical industry, the chemical show should emphasize this educational note.

At the last chemical exposition dyestuff exhibits were conspicuously absent. From an educational standpoint the American dyestuff industry failed to recognize this opportunity to impress the general public with its progress.

The chemical exposition this year will be the tenth. During the past decade our chemical industry has suffered severe growing pains. It stands to-day as a robust giant, able to present the American public many remarkable results of this growth. At its tenth exposition it will proudly display the notable achievements in chemistry that have marked the decade.

The dyestuff industry particularly can boast of incredible advances. The industry deserves prominent representation at the show. If a majority of the larger manufacturers are not planning to exhibit, there remains the alternative of a combined exhibit directed by a co-operating group of manufacturers, to convince the American public of what can be achieved "by the use of dyestuffs made in this country."

GRATUITOUS SERVICE—AN UNUSUAL PROPOSITION

The REPORTER recently received a communication from S. K. Bhavnagri, College of Technology, Sackville Street, Manchester, England, stating that he was anxious to obtain a position with some progressive American textile manufacturing concern in the dyehouse or print works where he could obtain practical experience and that he was willing to accept such a position without compensation providing the opportunities for obtaining experience were good.

It seems to us that this evidence of a disposition to succeed on the part of Mr. Bhavnagri should justify some one of our textile manufacturers in granting him such an opportunity. It is not every day that one meets a prospective employee who is willing to demonstrate his worth before asking for remuneration.

GOVERNMENT TO APPEAL DYE PATENTS SUIT

The Government has announced its decision to appeal to the United States Supreme Court its case against the Chemical Foundation involving the German dyestuff and chemical patents sold to the Foundation during the war.

Attorney-General Sargent states that after an examination of the opinions of the United States Circuit Court of Appeals at Philadelphia on the Chemical Foundation case, and after conference with his associates relative to the principles involved in the patent litigation and with officials of the Chemical Foundation, he has concluded to take an appeal in this case to the Supreme Court in view of the consideration involved "and expecially the responsibility devolving upon the Government."

Considerable legal work is entailed in preparing for the trial in the higher court, and it is impossible to ascertain when the case will again come up; although it was mentioned that in cases where the Government is a party and where public interest is a prominent factor it is frequently the procedure to advance the suits for hearing before they would regularly be called.

NEW MICROSCOPIC DEVICE FOR ANALYSIS OF TEXTILES

Letters patent covering a new type of instrument for the analysis of textiles, their fibers and weaves, have been applied for by Harold Cruger, of Belding Bros. & Co.

This instrument, which is soon to be put on the market, embodies new features, making it the most efficient yet to be offered.

A binocular microscope is mounted on a movable carriage over a ground glass screen which is illuminated by means of electric bulbs beneath. Micrometer action is obtained by means of a rack and pinion action which moves the carriage over a sample fastened on the screen so as to be readily analyzed on both warp and filling without changing the position of the sample or instrument.

In the case of heavy fabrics, not transparent, light is reflected downwardly upon the sample from above, throwing each thread into bold relief. A means of following each thread of warp and filler is provided with a direct reading from a scale on the carriage.

The binocular microscope allows the use of both eyes by the operator with the resultant reduction of eyestrain and increase in efficiency through gain in time.

Sufficient space is provided below the microscope to allow dissection with the pick needle. This is hard to obtain in instruments now in use without danger of disturbing the glass and throwing the sample out of adjustment.

The lighting arrangement makes use of the instrument possible in any place at any time without danger of shadows cast by the operator on his work.

Permanency and ease of adjustment of sample and microscope are readily obtained, making it possible to resume work where left off, should it be necessary to stop before an analysis has been completed.

The microscope may be readily removed from its carriage and by means of a separate base may be used in connection with present forms of twist counters at the loom, or on the examining table.

Exclusive license to manufacture and sell has been granted to E. Leitz, Inc., 60 East Tenth Street, New York City, who are well known as manufacturers of high-grade microscopes and laboratory supplies.

SHOE AND LEATHER COLORS FOR FALL

The new card showing shoe and leather colors for the 1925 fall season, issued by the Textile Color Card Association, contains samples showing six shades: National Gray, Autumn Blond, India Tan, Rosewood, Woodland Brown and Rugby Tan. These shades have been adopted by the National Boot and Shoe Manufacturers' Association and the National Shoe Retailers' Association, and sponsored by the National Association of Hosiery and Underwear Manufacturers.

George R. West, Jr., has been appointed superintendent of the Dixie Mercerizing Company, Chattanooga, Tenn., to succeed the late J. E. Evans, Jr.

ADVANCING THE SCIENCE OF CHEMISTRY

A booklet that should be of great general interest to all interested in any form of chemistry has been issued by the Johns Hopkins Half Century Committee. It is entitled, "Advancing the Science of Chemistry," and its brief message embodies the developments in the broad field of chemical science and the part in those developments which men from Johns Hopkins Department of Chemistry have played.

In the first chapter of the booklet, "The Development of a Great Science," the importance of chemistry in our national life and activities is summarized and the early days of the science described. The second chapter deals with the story of a great department, the Johns Hopkins Department of Chemistry. The chemists of Johns Hopkins, many of them world famous, and the work these men have accomplished in advancing the science of chemistry is here concisely set forth. Their noteworthy achievements, researches and discoveries in the various branches of chemical science are described.

The third chapter of this highly interesting booklet portrays the preparations for the future, hinting at new worlds to conquer in the realm of chemical research. An interesting section of this chapter describes the newly completed chemistry laboratory of the Johns Hopkins University.

CORRECTION

The article giving statistics on dye production and sales during 1924, appearing in the April 20th issue, gave 5.35 cents per pound as the average price in the United States of coal tar dyes during 1924, describing this as "a new low level." Our readers, we assume, will understand that this was a typographical error resulting from a misplaced decimal point. The average price should have appeared as fifty-three and one-half cents, the figure correctly given in the report from the United States Tariff Commission.

AMERICAN CELLULOSE & CHEMICAL MANUFACTURING COMPANY

The financial statement of the American Cellulose & Chemical Manufacturing Company, appearing in a folder recently issued to its stockholders, indicates the remarkable development in one branch of the artificial silk industry. The balance sheet of this company, as of December 31, 1924, shows fixed assets consisting of property, plants, construction in progress, organization, etc., of $7,074,162.32. Its total current assets are shown as $2,665,363.70. This item includes cash in banks and on hand of over $1,400,000. Current liabilities are listed as $171,475.66. It is a fact worth noting that in this statement patents and good-will are rated at nothing, although they must actually represent considerable potential value.

Harry Bentley is now superintendent of bleaching, dyeing and finishing in the Phenix (R. I.) Lace Mills. He was formerly with the Bradford (R. I.) Dyeing Association.

It is reported by Trade Commissioner William T. Daugherty, Berlin, that Griesheim/Elektron proposes to erect a plant in Bitterfield (Central Germany) for the production of chloride of sulphur and for the chlorination of hydrocarbons. This may refer to the oft-mentioned proposal of Griesheim/Elektron to shift some of its production to the Central German area, in connection with its rapprochement with the "Aktien Ges. f. Anilin Fabrikation," whose dye and photo chemical apparatus is located at Wolfen bei Bitterfeld.

The W. A. Jones Foundry & Machine Company, of Chicago, has issued its new General Catalog No. 30 containing 448 pages of power transmission machinery data including cut gears, cast gears, spur gear speed reducers, enclosed worm gear drives, cast iron pulleys, friction clutches, sprocket wheels, hangers, pillow blocks, couplings, rope sheaves, etc.

The American Piece Dyeing & Skein Printing Company has been organized at Paterson, N. J., with a capital of $50,000 to operate a local mill. John E. Gagliardi, 448 E. Twenty-second Street, who is one of the incorporators, has been appointed representative.

The Proximity Manufacturing Company, Greensboro, N. C., has just put into operation its new equipment for dyeing warps indigo by the continuous method. The equipment, built by the Cocker Machine & Foundry Company, Gastonia, N. C., is the second of its type installed by these builders in mills of the Proximity Manufactured Company, in the last twelve months.

The National Yarn Processing Company recently organized at Rossville, Ga., with capital of $600,000 by T. H. McKinney, Tom Moore and Scott Probasco, all of Chattanooga, will build a new finishing plant, consisting of two buildings, one of them of reinforced concrete, two stories for winding and finishing, and the main building of steel construction, 60 by 50 feet and equipped for a weekly capacity of 150,000 pounds of mercerized and bleached yarns.

ALBERT R. RITTGER COMPANY

Albert R. Rittger announces his retirement from the firm of A. Klipstein & Co., after a service of twenty-three years. On April 1st Mr. Rittger opened up business in the dyestuff and chemical line under the title of Albert R. Rittger Company at 29 West Thirty-fourth Street, New York City.

The Chicago office of Innis, Speiden & Co., Inc., manufacturers, importers and distributors of industrial chemicals, heretofore located at 120 W. Kinzie Street, has recently been moved to their new Chicago building at 722-724 West Austin Avenue, just completed as a combined office and warehouse.

Their facilities for handling business in the Middle West are thus greatly improved.

There will be held by the United States Civil Service Commission on May 19th a competitive examination for a chemical engineer to fill a vacancy in the fixed nitrogen research laboratory of the Department of Agriculture.

Columbia University is offering a graduate course in chemical engineering to a limited number of qualified students. The course will open on June 1st and will extend over a period of six weeks. It will comprise an intensive study of the unit operations in chemical engineering and will occupy the students' entire time during that period.

George Hayes, superintendent of bleaching, dyeing and finishing in the Phenix (R. I.) Lace Mills for many years, resigned recently to accept a similar position with the Port Jefferson (N. Y.) Lace Company, Inc.

C. K. Brooks is now employed at the Kerr Bleaching & Finishing Works, Inc., Concord, N. C. He was formerly with the Proximity Print Works, Greensboro, N. C.

It is reported the additional unit of the Viscose Company, to be erected at Roanoke, Va., will cost approximately $3,500,000.

The Berkeley Woolen Mills, of Martinsburg, W. Va., are reported planning to erect a four-story addition to their plant to double capacity.

The Erwin Cotton Mills Company, of Duke, N. C., is having two continuous one-run warp indigo dyeing equipments installed in its new mill by the Cocker Machine & Foundry Company, Gastonia, N. C.

The Union Manufacturing Company, of Union Point, Ga., is building a new brick dyehouse, 150 by 60 feet, to take the place of the old dyehouse.

CHEMISTRY AT THE SIZE KETTLE

(*Continued from page* 284)

the power plant, so also, are more efficient lubricants replacing tallow at the size kettle.

For a time there appeared a theory that nothing that could not be readily dissolved in water could or should be used in the size kettle, and only as recently as ten and fifteen years ago the life of many weavers was made miserable by attempts to use sulphonated castor or corn oil, treated fish oils, rosin soap and all the nostrums of quack science.

Another method of modification suggested every time a brewery has a surplus stock of malt syrup is by means of malt diastase, placed on the market under various names. In the last twenty-five years this method has been advocated at four or five definite periods, but its use has always been brief, for the action of diastase in the size kettle is to convert the starch into sugar (maltose), thus destroying the very material (starch) on which depends the value of the size, and this process is therefore worse than useless.

The manufacturers of thin boiling starches also convert the starch into sugar, though not in so obvious a manner, but nevertheless have caused you untold trouble, with attending decreased production for the last five or six years.

It is not necessary to convert starch at the size kettle in order to produce the best sizing.

The question before us is to discuss the function of a properly compounded sizing material. It should blend with and act on the starch in such manner as to develop the full strength of the normal starch and at the same time impart to it the necessary flexibility and lubrication permitting the dressing to adhere to the yarn under all the stress and strain of the loom. Unless the size does this, and all of this, it fails in its function regardless of how fine the warps feel or appear at the slasher.

The action of sizing compounds is twofold: one physical, in that it promotes the proper dispersion of the various softening and lubricating materials; the other chemical, on which depends the correct effect on the starch. This extremely mild process develops the life and flexibility of the resulting film. The theory of this action I do not propose to discuss, only the results of it being of importance to the weaving fraternity. Without this chemical action you produce a film which when fresh possesses a fair degree of flexibility and which yields yarns which at the slasher appear to be nicely sized. With age, however, this film soon becomes harsh and brittle, and during the weaving these warp yarns do not produce the results expected. The weaving room soon takes the aspect of a snow scene, and production decreases in quantity as well as in quality.

Where the starch has been treated scientifically we find that the yarns are unchanged with age, and that in the loom and in the cloth the warps retain the strength and weight acquired at the slasher. As some of the warps remain in the loom as much as six weeks or longer, every one of us appreciates that the permanency of the size film is its most important factor.

Sizing is the keystone in the arch connecting the spinning and the weaving of the yarn, and this applies not only to the cotton and artificial silk fibers in which this audience is particularly interested but applies to carpet warps just as well as it also applies to the manufacture of the finest merino fabrics.

You may spin your yarns as evenly and as carefully as you will, adjust your loom so that absolute synchronization is attained, then size your yarns when the starch is carelessly measured or weighed, the compound added by similar guesswork, and the whole cooked or half cooked as the exigency of the occasion demands, and you will not and cannot get efficient production.

The proper handling and proportioning of the compound is just as important to efficient operation as is the selection of the compound in the first place. It must be used with the same amount of the same starch, mixed and boiled with the same amount of water, for the same length of time, not once or twice, but each time and every time a batch of size is made, and for these reasons we strongly urge the installation of devices that will remove the uncertainty of haphazard operation along with the use of competent chemical size service.

Most of the faulty theories advocated have had but short life and are rapidly discarded and forgotten, but there comes from time to time the echo of such false doctrines and analysts of bleacheries will convey a false impression by telling you that a sizing ingredient contains so much soluble and so much insoluble, so much saponifiable and so much unsaponifiable, leaving you to judge what may or may not be removable in the processes of bleaching, dyeing and finishing.

To go into a discussion of removables in the finishing processes involves the consideration of the physicochemical properties of colloids, and the advance made in this field has been very considerable of late, but it is clear that many so-called unsaponifiables or insolubles are more readily removed than some solubles, and that *many tend to promote rather than interfere with the finishing processes.*

Considerable advance is also being made in the study of the fundamentals of bleaching, and particularly in the study of reagents promoting the cleaning of cloths preparatory to bleaching. Very small quantities of such material as natural pine oils, tetraline, hexaline and other hydrogenated products have been found to have profound effects in the scouring bath.

Let us also remember one fact which all bleachery chemists seem to evade or overlook, which is, that from an ordinary ton of cloth bleaching will remove on the average about 100 pounds of the cotton waxes, gums and cellulose; also about 100 pounds of starch and only about one or two pounds of any other sizing lubricant or chemical. You should advise your finishing plants of these fundamentals when they blame you for some of their own misdeeds or shortcomings.

The important object of the fraternity which I represent is to have a thorough appreciation of the above facts and to promote the removal of the starch and natural gums and waxes to the better preservation of the cellulose of the fiber. That this service is being rendered is shown by the ever-increasing use of chemical sizes.

These are the fundamentals of the chemical processes under discussion, and it is evident that *the science of correct sizing rests on the effect of the starch by the chemicals in the sizing compound*. The qualities of the resulting film is determined by the character of the chemicals, as well as by the proportion in which they are combined.

Practice has shown you that it is not possible to embody all of the required ingredients into a pinch or thimbleful of magic; but that the preparations which give the best loom production are those wherein every phase of the problem is duly comprehended and provided for.

In conclusion and before answering any question which may be asked let me repeat that the character of the size film has much to do with your weaving results, for else how could mills similarly equipped obtain 89, 90 and 91 per cent with one kind of size on the popular broad cloth construction whereas neighboring plants using the same cotton, the same machinery and just as good yarn only produce seventy to seventy-five. Such difference between good and poor weaving production will surely determine the profit or loss of your operation.

Dyestuff Tables

A List of the Principal American-Made Colors with Their Properties and Fastness Characteristics

[NOTE: The publishers of The REPORTER have secured more or less complete data in regard to many of the dyestuffs which are at the present time being manufactured in the United States. As the following material has been brought together from various sources, they realize that errors are quite likely to appear, and it is earnestly requested that any readers who find errors or who are able to give additional information will communicate with the publishers in order that this material may be made as correct, complete and up to date as possible. These tables will appear serially until all colors upon which we have data shall have been covered. The publication of this data was begun in the issue of March 10, 1924.]

BENZO SKY BLUE

(Schultz No. 426)

COMPOSITION: Disazo.

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: With salt at the boil.

SHADE: Duller than S-424.

SHADE BY GASLIGHT: Redder.

SOLUBILITY: Excellent.

LEVEL: Dyes level.

EXHAUSTS: Not completely.

FASTNESS TO:

Acid: Fast to acetic acid.
Alkali: Greener with soda.
Chlorine: Destroyed.
Cross-Dyeing: Not suitable.
Fulling: Not suitable.
Ironing: Temporarily redder.
Light: Moderate.
Perspiration: Fast.
Rubbing: Fast.
Sulphur: Fast.
Washing: Moderate; bleeds off.

OTHER PROPERTIES: Suitable for pad dyeing.

DYED BY OTHER METHODS: After-treated with copper sulphate, very little change in shade but faster to washing.

ON UNIONS: Cotton-wool unions: The wool is very light. Cotton-silk unions: The silk is left white.

ON OTHER MATERIALS: Lustron silk-effect threads are left almost white. Artificial silk dyed with salt.

PRINTING: Suitable with phosphate of soda.

DISCHARGING: Discharges white with tin zinc or hydrosulphite.

COMPETING PRODUCTS: Made in the United States by American Aniline Products, Inc., under name of Amanil Sky Blue; Amalgamated Dyestuff & Chemical Company, under name of Amidine Sky Blue 5BN (Selling Agents, John Campbell & Co.); Cincinnati Chemical Works, under name of Benzamine Pure Blue; Newport Chemical Works, under name of Direct Sky Blue; Calco Chemical Works, under name of Direct Sky Blue Conc.; National Aniline & Chemical Company, under name of Niagara Sky Blue; Palatine Aniline & Chemical Corporation, under name of Pacco Direct Sky Blue BE (Selling Agents, F. E. Atteaux & Co.); E. I. du Pont de Nemours & Co., under names of Pontamine Sky Blue 5BX and Pontamine Sky Blue 5BX Conc.

COLUMBIA BLACK FF

(Schultz No. 436)

COMPOSITION: Trisazo.

SPECIALLY SUITABLE FOR: Cotton dyed direct only.

USUAL METHOD OF DYEING: With salt (too much salt must be avoided; 10 per cent will be sufficient. The presence of soda in the bath tends to produce a brownish shade.)

SHADE: Very similar to S-463.

SHADE BY GASLIGHT: No change.

SOLUBILITY: Good.

LEVEL: Dyes level.

EXHAUSTS: Well.

FASTNESS TO:
Acid: Fast against acetic acid; bluer with mineral acids.
Alkali: Fast.
Chlorine: Destroyed.
Ironing: Shade goes temporarily redder.
Light: Inferior to S-463; fades reddish.
Perspiration: Fast.
Rubbing: Fast.
Washing: Average for substantive dye.

OTHER PROPERTIES: Dyes cold fairly well; gives good tinctorial value.

DYED BY OTHER METHODS: Not suitable for diazotizing and developing or for after-treatment with copper or chrome.

ON UNIONS: The cotton is heavier than the wool. The shade on the cotton is redder than the wool. Cotton-silk unions: The silk is stained heavily. Lustron-silk-effect threads are left fairly light.

COMPETING PRODUCTS: Made in the United States by American Aniline Products, Inc., under name of Amanil Black FF; Amalgamated Dyestuff & Chemical Company, under name of Amidine Fast Black FF (Selling Agents, John Campbell & Co.); Cincinnati Chemical Works, under name of Columbia Black; Consolidated Color & Chemical Company, under name of Columbia Black FF (Selling Agents, H. A. Metz & Co.); National Aniline & Chemical Company, under name of Erie Black NR Extra; E. I. du Pont de Nemours & Co., under name of Pontamine Fast Blackk FF.

DIAZO BLACK
(Schultz No. 441)

COMPOSITION: Trisazo.

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: Salt and soda.

SHADE: Dark blue when dyed direct. Dyed and developed with beta-naphthol, bluish black.

SHADE BY GASLIGHT: Redder.

SOLUBILITY: Good.

LEVEL: Dyes level in blacks.

EXHAUSTS: Well.

FASTNESS TO:
Acid: Fast to acetic. Redder and duller with mineral acids.
Alkali: Fast.
Chlorine: Destroyed.
Cross-Dyeing: Will not stand cross-dyeing.
Fulling: Temporarily redder.
Light: Very moderate.
Mercerizing. Will not stand mercerizing.
Perspiration: Fast.
Rubbing: Fast.
Steaming: Will not stand steaming.
Washing: Moderate when dyed direct. Dyed and developed, improves fastness.
Water: Fairly fast.

SENSITIVE TO METALS, LIME: Not sensitive to copper or iron.

OTHER PROPERTIES: Dyes cold.

DYED BY OTHER METHODS: After-coppered and after-chromed, the shade is not faster.

ON UNIONS: Cotton-wool unions: The wool is stained slightly.

DISCHARGING: Discharges white with hydrosulphite.

COMPETING PRODUCTS: Made in the United States by National Aniline & Chemical Company, under the name of Niagara Blue DB; Newport Chemical Works, under name of Diazo Black RS.

DIRECT DARK BROWN B
(Schultz No. 448)

COMPOSITION: Trisazo.

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: With salt.

SHADE: Dull yellowish brown.

SHADE BY GASLIGHT: Unchanged.

SOLUBILITY: Good.

LEVEL: Dyes level.

EXHAUSTS: Slowly.

FASTNESS TO:
Acid: Turns somewhat redder with acid.
Alkali: Fast.
Light: Moderate dyed direct.
Washing: Moderate dyed direct.

DYED BY OTHER METHODS: After-treated with copper sulphate, the shade is much deeper and faster to light and washing.

ON UNIONS: Cotton-wool unions: The cotton is dyed deeper than the wool. Cotton-silk unions: The cotton is deeper than the silk.

DISCHARGING: Discharges white with hydrosulphite.

COMPETING PRODUCTS: Made in the United States by Garfield Aniline Works, under the name of Direct Brown B (Selling Agents, U. S. Color & Chemical Company).

DIRECT FAST BROWN BT
(Schultz No. 449)

COMPOSITION: Trisazo.

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: With salt.

SHADE: Dull yellowish brown.

SHADE BY GASLIGHT: No change in shade.

SOLUBILITY: Good.

LEVEL: Fair.

EXHAUSTS: Fairly well.

(Continued on page 312)

The Reddening of Sulphite Pulp

The Nature of the Reddening Problem—Available Data from Previous Investigations—Tests Described —Action of Sulphurous Acid—Sulphurous Acid with Acetic and Sulphuric—Neutralization with Soda Lye—Sulphurous Acid and Sodium Chloride

By DR. E. OEMAN

(Translated by Dr. Paul Bartholow)

IT appears from the literature that the reddening of sulphite pulp has been a question of interest for a long time. Quite recently this problem has been before us again, and various views of its causes and mode of prevention have been set forth by H. E. Wahlberg (Svensk Papperstid, No. 22, 1922; No. 3, 1923), E. Heuser and S. Samuelsen (Papierfabr, 1924), and S. Samuelsen (Svensk Papperstid, No. 7, 1924). In these articles will be found the most important literature concerning this question.

My experience with regard to the reddening of sulphite pulp is that this peculiarity is apt to occur with almost any unbleached sulphite, though in a very different degree, and also that it appears after various intervals of time. In general, freshly manufactured pulp in the moist state should not redden, but when stored for a time the red color increases until a maximum is reached, after which the color again disappears. This formation and decrease of the coloring substance —that is to say, the process of conversion which takes place in the sulphite pulp—is more energetic when light is admitted to the pulp than if it is kept in a dark room. It is in the highest degree probable that this depends on some substance which arises in the pulp through the development of an oxidation process whose first oxidation product gives a red color in the presence of moisture, but whose secondary product is colorless. This conclusion agrees with practical experience with bleaching and paper making, and also with the investigations made. We may suppose that both of these stages of continuous oxidation continue during the whole time, but that coloration occurs more rapidly in the first stages than in the later. It seems to happen, therefore, that when pulp is stored an increase of these oxidation products occurs—that is to say, of those which give the pulp its red color under conditions of moisture—but as the quantity of the original substances diminishes, so the new formation of these coloring matters simultaneously declines more and more. The velocity whereby the red substance is oxidized further to a colorless substance should be dependent on the concentration of that previously formed in the pulp. As a result, a maximum intensity of coloration is reached, after which it recedes.

If the problem were limited to removing the red color from the pulp the matter could be easily remedied, as we shall see below. But this is not sufficient so long as the new formation of the red coloring matter does not cease completely; which, however, does not occur until after a very long interval of storing. Instead, the problem is to prevent the formation of such substances as color the pulp red, or to hasten both oxidation processes so much that they both are completed in the same time that the pulp is treated. Heuser and Samuelsen have made use of the latter method by means of the addition of potassium persulphate.

Other investigators have come to very different conceptions of the conditions under which reddening arises. It is probable that the various results are dependent on the fact that we have to do with a reaction, dependent on the age of the pulp, whereby with one and the same sample, but taken at different times, we can reach different results. If, for example, the oxidation process has gone so far that no further formation of new reddening substance worth mentioning can take place, and we succeed through certain chemical means in removing the red color, the pulp is not affected by further storage; in other words, no further reddening appears. On the other hand, if the oxidation process has effected only a partial conversion of the original substance into the red coloring matter, then we can expect that even if the red substance is removed the pulp, on longer storing and in the presence of moisture, will become red, owing to the formation of new coloring matter in the cellulose, in which case the pulp is not stable but after a while reddens in the presence of moisture. The data found in the literature concerning the various methods of treating sulphite pulp and the results gained thereby in changing the coloration, etc., in most cases contain nothing on the subject of the age of the pulp and the conditions under which it is stored. In this detail lies apparently a considerable weakness in the researches and attempts to clear up the matter, whereby the solution of the problem has been in a high degree made difficult. Finally, it is to be recalled that in all certainty we have to deal with variations depending on the locality of origin of the pulp and wood respectively. Thus cellulose from wood of the northern portions of Scandinavia and Finland may not give in this respect always the same result as that from southern Germany, Austria

and other countries. It appears from German literature that complaints as to the reddening of sulphite pulp impeach the Scandinavian in particular.

In all investigations of the reddening of sulphite pulp the observations in every instance must have regard to the color changes in the material itself, because we obviously have no other method of determination. The trouble is that such a method is more subjective than real. If the object here be simply to determine how much of the color has disappeared—that is, the diminution of color intensity—judgment is not so difficult, and we may be certain that no other color reaction has had any great degree of influence on the nature of the result. But if we have a sulphite pulp which has been treated in one way or another with chemicals, and which after careful washing should be tested to determine whether it will be permanently free from color when treated with various oxidation agents, we find ourselves on uncertain ground. The color which we obtain with oxidizing agents need not, as a matter of fact, be identical with the color which gives the red shade to the pulp after a long interval of storing. It may be observed that the color obtained with this manner of testing the samples is described in the literature as of a different shade from the original. It might be questioned if the test with oxidizing agents—for example, hydrogen peroxide—is reliable in forming a judgment as to the permanent freedom of the pulp from color and as to whether in time it would become red when moist. Certain it is that hydrogen peroxide can color such sulphite pulp as would not redden during storage but which would remain permanently white.

It seems as if the investigations described in the literature concerning the reddening of sulphite pulp always took too little account of the kinetic conditions (time reactions) which occur. In the following, for the sake of clearing up the question in this regard, the author will present a portion of the results of his investigations. The sulphite pulp used in the experiments was from northern Sweden, manufactured in the usual manner and dried on the paper machine. The tests were carried out in such a manner that a certain weight of air-dry pulp was moistened, ground and expressed, whereupon it was introduced into the different solutions. In this way the fiber consistency was about 10 per cent. Changes of color were observed by comparison with the same pulp in distilled water.

A.—Action of Sulphurous Acid

Sample No. 1 (solution contained 0.16% SO_2)—
- Appearance after five minutes.....Grayish-white
- Appearance after ten minutes.....White
- Appearance after thirty minutes.....White
- Appearance after one hour.....White

Sample No. 2 (solution contained 0.032% SO_2)—
- Appearance after five minutes.....Faint red
- Appearance after ten minutes.....Grayish-white
- Appearance after thirty minutes.....Grayish-white
- Appearance after one hour.....White

Sample No. 3 (solution contained 0.008% SO_2)—
- Appearance after five minutes.....Three-quarter red
- Appearance after ten minutes.....One-half red
- Appearance after thirty minutes.....Faint red
- Appearance after one hour.....Grayish-white

Sample No. 4 (solution contained 0.0016% SO_2)—
- Appearance after five minutes.....Red
- Appearance after ten minutes.....Three-quarter red
- Appearance after thirty minutes.....One-half red
- Appearance after one hour.....One-half red

In sample 4 the sulphurous acid was consumed; in the other samples it was still present in the solution after an hour's treatment. Similar tests were made at 55 deg. Cent., but with 0.016 per cent of SO_2 in the water; thus the concentration of the solution lay between samples 2 and 3. The pulp was white after three minutes. In this instance the color disappeared in about one-twentieth of the time which elapsed at ordinary temperature. This increase of velocity on account of higher temperature agrees with what holds good generally for the increase in the velocity of chemical reactions by heat.

It is probable that the removal of the color by means of sulphurous acid is in the nature of a reducing process, but it may also be conjectured that the sulphurous acid acts by virtue of its properties as an acid. In order to clear up this point the following experiment was made, in which, besides sulphurous acid, other acids, acetic and sulphuric, were present.

B—Sulphurous Acid with Acetic and Sulphuric

In each sample the SO_2 content in the solution was 0.016 per cent and the test was made at ordinary temperature. The composition of the solution appears from the following table:

Sample No.	SO_2 in Solution		Acetic Acid in Solution		Sulphuric Acid in Solution	
	In %	In Nor.	In %	In Nor.	In %	In Nor.
1.....	0.016	0.0025	....	....	....	....
2.....	0.016	0.0025	0.006	0.001	....	....
3.....	0.016	0.0025	0.012	0.002	....	....
4.....	0.016	0.0025	0.030	0.005	....	....
5.....	0.016	0.0025	....	....	....	....
6.....	0.016	0.0025	....	....	0.005	0.001
7.....	0.016	0.0025	....	....	0.010	0.002
8.....	0.016	0.0025	....	....	0.025	0.005

Here the sulphurous acid is estimated as a monobasic. The results of the experiment showed that in tests 1 to 4 no difference in color could be established, but in tests 5 to 8 the rose color disappeared, most rapidly in sample 8, somewhat more slowly in samples 7 and 8, and slowest of all in sample 5. Consequently, the presence of acetic acid had no influence on the power of sulphurous acid to remove the red color, but, on the other hand, the presence of sulphuric acid had a certain effect in hastening the disappearance. In

order to make an explanation of this condition, we must see how these different acids are dissociated.

Sulphurous acid is dissociated according to—

$$H_2SO_3 \longleftrightarrow \overset{+}{H} + \overset{-}{HSO_3} \ldots\ldots (1)$$
$$\overset{-}{HSO_3} \longleftrightarrow \overset{+}{H} + \overset{--}{SO_3} \ldots\ldots (2)$$

whence dissociation according to (1) has a dissociation constant of $1.7 \times \overset{-2}{10}$, and, according to (2), of $1.0 \times \overset{-7}{10}$.

We get therefore for (1)*

$$\frac{H \cdot HSO_3}{H_2SO_3} = 1.7 \cdot \overset{-7}{10} = 0.000{,}000{,}1$$

Dissociation according to (2) is clearly only a fraction of the dissociation according to (1), and can therefore be disregarded in comparison with dissociation according to (1). Now, if we have sulphurous acid in pure water, then H must naturally equal H_2SO_3, because we must have an equal number of positive and negative ions.

$$\frac{H \cdot H}{H_2SO_3} = 1.7 \cdot \overset{-2}{10} = 0.017$$

If we have from the beginning $0.0025 - n$ H_2SO_3 (monobasic), a portion of it is dissociated according to (1); viz., as much as corresponds in weight to the above-named. The portion which is not dissociated is, of course, $0.0025 - n$ minus the quantity dissociated. It is easy to calculate that the equilibrium obtained for H is 0.00221, because

$$\frac{0.00221 \times 0.00221}{0.0025 - 0.00221} = 0.0168$$

Thus 22/25—that is, 88 per cent—of the sulphurous acid is dissociated according to (1) as well as 12 per cent of the non-dissociated acid H_2SO_3. We get, therefore, various concentrations:

$$H = 0.0022$$
$$HSO_3 = 0.0022$$
$$H_2SO_3 = 0.0003$$

This is the case, however, at the beginning of the test, but afterwards, as the sulphurous acid is consumed, we get other concentrations.

If now we have sulphuric acid present from the beginning, as in experiments 6 to 8, we get other conditions of dissociation. Sulphuric acid itself is completely dissociated in these great dilutions. For 0.005 — n sulphuric acid (experiment 8) we have in the beginning:

$$H = 0.0068$$
$$HSO_3 = 0.0018$$
$$H_2SO_3 = 0.0007$$

Since we find a distinct increase in the velocity with which the red color disappears when we have sulphuric acid present, we may surely maintain that it is not the HSO_3 ions which are thereby active. Since, further, simple acids in the concentration, of which it is a question, do not cause any particular change in the red color, we can suppose that the hydrogen ion (pH) concentration has no effect. Nor can it be a question of the neutralization in the presence of sulphurous acid, for then experiments 1 to 4 would not have given the same concentration of the different kinds of ions, but a greater proportion of hydrogen ions (greatest in 4), because the acetic acid is very slightly dissociated. Its constant is $1.8 \times \overset{-5}{10}$. There remains therefore only the explanation that it is the H_2SO_3 concentration that is effectual in causing the red color to disappear. In experiment 5 this is $0.0003 - n$, and in experiment 8 it is $0.0007 - n$. As appears above, we can discover a distinct difference between samples 5, 6, 7 and 8, as well as that 5 is the slowest and 8 the quickest. This agrees with the concentrations of H_2SO_3 in the various tests. It seems, therefore, as if it were the concentration of undissociated sulphurous acid, H_2SO_3, which is the deciding factor in removing the red color in sulphite pulp.

C.—Sulphurous Acid Neutralized with Soda Lye

In each sample the SO_2 content was 0.016 per cent. In sample 1 no soda lye was added; in samples 2 to 5 increasing amounts of soda lye were used. For the rest the tests were made as before. The treatment was carried on at ordinary temperature. The results appear in the following table:

Sample No. 1 (composition of solution, SO_2)—
- Appearance after five minutes.....Gray
- Appearance after ten minutes.....Grayish-white
- Appearance after twenty minutes.....Grayish-white
- Appearance after thirty-five minutes.....White

Sample No. 2 (composition of solution, $Na_2O + 3\,SO_2$)—
- Appearance after five minutes.....Red
- Appearance after ten minutes.....One-half red
- Appearance after twenty minutes.....Faint red
- Appearance after thirty-five minutes.....Faint red

Sample No. 3 (composition of solution, $NaHSO_3$)—
- Appearance after five minutes.....Red
- Appearance after ten minutes.....Three-quarter red
- Appearance after twenty minutes.....Three-quarter red
- Appearance after thirty-five minutes.....One-half red

Sample No. 4 (composition of solution, $Na_2O + 1.5\,SO_2$)—
- Appearance after five minutes.....Red
- Appearance after ten minutes.....Three-quarter red
- Appearance after twenty minutes.....Three-quarter red
- Appearance after thirty-five minutes.....One-half red

*Molecular concentration.

Sample No. 5 (composition of solution, Na_2SO_3)—
Appearance after five minutes.....Red
Appearance after ten minutes.....Three-quarter red
Appearance after twenty minutes.....Three-quarter red
Appearance after thirty-five minutes.....One-half red

Samples 3, 4 and 5 were about the same, sample 2 was distinctly less red, and sample 1 was the only one which was decolorized. This result agrees with the view previously set forth: that it is the sulphurous acid which removes the red color, for by the addition of soda lye the hydrogen ion concentration is diminished, without its being necessary to change the H_2SO_3 ion concentration. The result is, therefore, that the reaction $H_2SO_3 \longleftrightarrow H + HSO_3$ takes place in the direction of the arrow pointing to the right; that is, the concentration of undissociated H_2SO_3 is reduced. Since sodium bisulphite is dissociated according to $NaHSO_3 \longleftrightarrow Na + HSO_3$, the concentration of the HSO_3 ions is not reduced by the addition of sodium hydrate, but, on the contrary, it is increased (for 2 and 3). We have, therefore, another proof that the HSO_3 ions do not contribute to the disappearance of the red color.

D.—Sulphurous Acid with Sodium Chloride

The total SO_2 content in each sample was 0.016 per cent; to 2, 3 and 4 were added increasing quantities of NaCl. The treatment was carried on an ordinary temperature. Results were as follows:

Sample No. 1 (composition of solution, 0.0025 — n SO_2)—
Appearance after ten minutes.....Whitest
Appearance after twenty minutes.....Same color
Appearance after one hour.....White
Sample No. 2 (0.0025 — n SO_2 and 0.1 — n NaCl)—
Appearance after ten minutes.....Whitest
Appearance after twenty minutes.....Same color
Appearance after one hour.....White
Sample No. 3 (0.0025 — n SO_2 and 0.5 — n NaCl)—
Appearance after ten minutes.....Reddest
Appearance after twenty minutes.....Same color
Appearance after one hour.....White
Sample No. 4 (0.0025 — n So_2 and 2 — n NaCl)—
Appearance after ten minutes.....Reddest
Appearance after twenty minutes.....Pale red
Appearance after one hour.....Grayish white

The sulphurous acid is here estimated as monobasic. It is evident that an addition of common salt to the solution of sulphurous acid hinders the disappearance of the red color. We have the fo'lowing dissociations:

$$H_2SO_3 \longleftrightarrow \overset{+}{H} + \overset{-}{HSO_3}$$
$$NaCl \longleftrightarrow \overset{+}{Na} + \overset{-}{Cl}$$
$$NaHSO_3 \longleftrightarrow \overset{+}{Na} + \overset{-}{HSO_3}$$

If the concentration of the sodium ions is strong, a portion of $NaHSO_3$ is formed, which reduced the HSO_3 content, whereby the H_2SO_3 concentration is also lowered. Since H_2SO_3, as well as $NaHSO_3$, is fairly well dissociated, there cannot be such a great diminution in the content of undissociated H_2SO_3 by the addition of common salt; that is, it requires a very great concentration of common salt to cause a slight diminution of the undissociated H_2SO_3. It appeared also that the difference in the fading of the color was very slight. These tests also speak for the fact that it is the undissociated sulphurous acid which destroys the red color of sulphite pulp.

(To be continued)

Operatives of the dye works at Nantai, Foochow, recently went on strike for an increase of pay, their present wages being about $4 a month. The strikers demand $7 a month for a common operative and $10 for a skilled hand.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1924, OF AMERICAN DYESTUFF REPORTER.

Published biweekly at New York, N. Y., for April 1, 1925.

State of New York, County of New York, s.s.:

Before me, a notary public in and for the State and county aforesaid, personally appeared Alfred P. Howes, who, having been duly sworn according to law, deposes and says that he is the publisher of the American Dyestuff Reporter, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 445, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor and business manager are:

Publisher—Alfred P. Howes, 90 William Street, New York City. Editor—Louis A. Olney, Lowell, Mass. Managing Editor—Clayton Hoagland, 90 William Street, New Yo.k City. Business Manager—Alfred P. Howes, 90 William Street, New York City.

2. That the owner is: Howes Publishing Company, Inc., 90 William Street, New York City: Louis A. Olney, Lowell, Mass.; Alfred P. Howes, 90 William Street, New York City; Mary K. Howes, Northampton, Mass.; William F. Collins, Upper Montclair, N. J.; Derfla H. Collins, Upper Montclair, N. J.; N. H. Hiller, Carbondale, Pa.; Joseph L. Schroeder, Hartsdale, N. Y.

3. That the known bondholders, mortgagees and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association or corporation has any interest, direct or indirect, in the said stock, bonds or other securities than as so stated by him.

Alfred P. Howes, Publisher.

Sworn to and subscribed before me this 19th day of March, 1925.

[Seal.] John S. Mulcare.

(My commission expires March 30, 1926.)

Technical Notes from Foreign Sources

Treating Artificial Silk to Improve Dyeing Qualities

The dyeing of artificial silk, especially of the acetate variety, is fraught with considerable difficulty even after the proper dyestuff has been secured. In French Patent No. 563,785 a process is described for the dyeing of cellulose acetate silk in which this product is treated with various chemicals in order to make it possible for the coloring matter better to penetrate through the fibers.

To this end the acetate silk is treated with various salts of tin—as, for example, the chloride or the bichloride of tin—and then with alkaline salts, such as borates, carbonates and phosphates. These salts tend to increase the property of the acetate silk fiber for absorbing coloring matters.

For example, a mass of 100 grams of silk is first immersed in a solution which contains 800 c.c. of a 20-deg. Be. solution of the bichloride of tin. Then the silk is washed with water and thereafter plunged into a solution of silicate of soda, possessing a concentration of 2-deg. Be. The second immersion takes place at a temperature of 40 deg. Cent., and then the silken fabric is washed. It is claimed that this treatment does not remove any of the important and advantageous properties of the silk.

Producing a Soft Feel in Chemically Treated Cotton

When cotton is treated with sulphuric acid of 50.5 deg. Be., the product is transparent but its feel is very rough. In order to get around this difficulty, according to French Patent No. 563,734, which covers a process of Swiss origin, the additional of ammoniacal salt is essential. It is claimed that when solutions of these salts are employed in the process, a finished product is obtained, after customary washing and drying, that has the soft feel of velvet.

The composition of the bath used in this process is as follows: A 69 per cent sulphuric acid may be used, and to this acid there are then added 5 per cent of sulphate of ammonia and 26 per cent of water. The cotton fabric treated in this solution becomes transparent, and its softness and flexibility are so increased in proportion that the content of ammonia salt in the bath becomes greater and the proportion of water is reduced. The time of the immersion is from five to ten seconds at a temperature which varies between 10 and 18 deg. Cent. It is also possible to use ammonium chloride, ammonium acetate or ammonium phosphate in this process with equally as good results. Mercerized fabrics as well as bleached fabrics may be treated by this process. Immediately after the fabrics have been subjected to this treatment they are well washed with water and then dried under tension. It is possible to obtain design effects on the fabrics by the use of resist pastes containing gums or gelatine.

Producing Soft Finish on Woolen Goods

Boiling the woolen fabric with a mixture of water and fuller's earth is recommended as an excellent means for cleansing the goods after washing, fulling or carding. To this end the goods are placed in a perforated drum and allowed to come in contact with water for a period of four hours, the temperature of the water being between 90 and 100 deg. Cent. The goods are treated in the roll form and after treatment are unrolled and then immediately placed in a washing machine, where they are thoroughly rinsed with water and fuller's earth. The latter treatment lasts from forty-five to sixty minutes. All the extraneous matter and mucilaginous impurities are completely removed from a silken fiber in this manner. At the same time the woolen goods attain a soft, agreeable feel.

Certain fabrics, more particularly those that are heavy in weight, should be teased on both sides. In this connection it has been found advantageous, after having slightly teased the right side of the fabric, to immerse it in water for three to four hours at a temperature of 63 deg. Cent. Then the fabric is rinsed with a little fuller's earth and the teasing operation is continued. This treatment dissolves and removes mechanically all the traces of coloring matter and soap that are retained by the tissue. It adds to the soft feel of the goods. The latter are then immersed a second time in hot water, after teasing. The time and expense involved in this double treatment are more than compensated for by the better feel given to the goods.

It is recommended in the drying of washed or teased piece goods that the cloth is not kept in the moist condition any longer than is absolutely necessary. This is particularly important when the water used in the process is hard. If this precaution is taken, then the handle of the finished goods is very soft. It is generally held that the piece goods that are calendered acquire a less soft feel and possess a better luster than those dried by exposure to air in centrifugal machines; that is, a partial drying effect is secured in this manner before the real drying process is carried out. The reason for this is that the calendering operation is of the nature of a moist pressing.

It is also advisable not to employ too high a temperature in the drying apparatus and to make certain that the ventilation of the apparatus is as thorough as possible. In reality, it is necessary to conduct the artificial drying operation in such a manner that the conditions that govern natural drying in the open air are

followed out as closely as possible; it is only in this manner that the textile will keep its soft handle. Many textile mills prefer to use a drier that is heated by means of steam coils which are arranged along the entire length of the apparatus, the drying itself being effected by the heated air.

(For further details see the article in Revue Generale des Matieres Colorantes, 1925, page 23.)

Dyeing of Acetate Silk

A paper was recently read before a meeting of the Society of Chemical Industry in England and abstracted in the Chemical Age of London, 1924, page 577, in which the dyeing of acetate silk is discussed from various standpoints.

It is said therein that chemically acetate of cellulose might be considered more acidic than cellulose itself, as indicated by its strong attraction for the bases, which if sufficiently strong would regenerate hydrated cellulose. The earliest cellulose acetate fibers of a number of years ago only took up basic colors substantively after drastic treatment to swell the fiber. In England the method of saponification or hydrolysis was elaborated, while in Switzerland the dyeing was carried out with simple basic coloring matters without mordants, inorganic salts being used for heavier shades; as, for example, magnesium chloride. In practice the saponification method was difficult to control, the dyer was working in the dark, faults were not apparent until the end of the operation and were then beyond correction. A considerable amount of the saponification was completed during the first five minutes, which meant an extremely sensitive process. Unevenness became greatly accentuated, since any portion of the surface first attacked by the alkali subsequently absorbed more of it and became further hydrolyzed in preference to the remainder. There were also a substantial loss in weight and some effect on the luster, resistance to abrasion, etc.

The ultimate solution of the problem lay in the synthesis of colors that were especially adapted for dyeing acetate silk. The author describes the processes which finally led to the development of the SRA colors. These colors are now compounded in such a manner that there is no more trouble experienced in dissolving them than any of the ordinary dyestuffs. They can be mixed with the direct cotton colors and applied in the same dye baths.

Protecting Animal Fibers Against Alkalies

Animal fibers that are made up into yarns and fabrics often come in contact with alkaline liquors used in the manufacturing and finishing operations. A new process has been developed for protecting these fibers during the progress of these treatments. This process consists in the addition of condensation products of the aromatic series to the alkaline liquors.

For example, raw silk is degummed in a bath which contains from 6 to 9 grams of sodium hydroxide to the liter, the process being carried out at a temperature of 50 deg. Cent. This alkaline bath also contains from 9 to 12 grams of 30 per cent solution of the condensation product that is forced from the reaction between 2 molecules of naphthalene sulphonic acid and 1 molecule of formaldehyde. The degummed silk is then washed, soured and washed again. The lustre and the elasticity of the silk are retained.

In another process a half-woolen fabric is treated for one hour at a temperature of 30 to 35 deg. Cent. in a color bath made in the usual manner with the admixture of a proper amount of sodium sulphate. The dye liquor contains one part of a sulphur dyestuff, one to one and one-half parts of crystalline sodium sulphide, and from two to three parts of the synthetic tanning material that is obtained by the sulphonation of the residue that remains from the distillation of anthracene. The cotton part of the fabric is well covered with the dye, while the woolen part remains almost entirely uncolored, and it does not lose either its strength or its soft handle. Ordinarily, as is well known, sodium sulphide has a very deleterious action on the woolen fiber.

In still another example a half-silken fabric is treated for one hour at a temperature of 60 to 70 deg. Cent. Here again the dye liquor is made in the usual manner with the addition of sodium sulphate, and in every liter of the liquor there are contained one part of a sulphur dyestuff, from one to one and one-half parts of crystallized sodium sulphide, and from two to three parts of the synthetic coloring matter mentioned above. The fabric is then washed, soured and brightened in the usual manner. When the dyeing operation is carried out in this fashion, both the silk and the cotton are dyed in equal strengths. The silk is not injured in any way whatsoever by this treatment. (Deutsche Faerber Zeitung, 1924, page 543.)

Decreasing Wool with Kaolin

The French journal L'Avenir Textile, 1924, contains a note on the degreasing of wool by means of kaolin. It is said that the greasy matters contained in the woolen fiber can be more easily removed by means of pure clay than by the use of soap alone. This is the reason why kaolin is employed in the degreasing of wool. The latter product should be used in the proportion of soap 2 per cent and kaolin 2 per cent, the remainder of the mixture, or 96 per cent, being water. The temperature of the operation should be in the neighborhood of 50 deg. Cent. The woolen fiber that is degreased with the aid of kaolin is whiter than that washed with soap alone. The essential point in the process is to work in the presence of at least 1 per cent of sodium carbonate; for, due to its chemical nature, the kaolin must be alkaline in order to exert its cleansing action in the proper fashion.

DYESTUFF TABLES

(*Continued from page 305*)

FASTNESS TO:

Acid: Turns somewhat redder.
Alkali: Turns slightly yellower.
Chlorine: Very moderate.
Cross-Dyeing: Not suitable.
Fulling: Dyed direct, moderate. After-treated with chrome and copper, much better.
Ironing: Fast.
Light: Moderate, dyed direct.
Perspiration: Moderate.
Rubbing: Fairly fast; smuts slightly.
Washing: Dyed direct, moderate. Faster after-treate d

SENSITIVE TO METALS, LIME: Sensitive to copper; shade is weaker, dull and yellower.

MACHINE DYEING: Sensitive to iron; shade is redder and duller.

OTHER PROPERTIES: Not as suitable for cotton-wool unions as the Amanil Chrome Browns GR and RR.

DYED BY OTHER METHODS: Dyed direct, this color is of no great importance. After-treated with chrome and copper, the fastness to washing and boiling is greatly improved, while the shade is not greatly altered, as is the case with the Amanil Chrome Browns GR and 2R.

ON UNIONS: Not suitable for cotton-wool unions or cotton-silk unions, as the wool and the silk are stained deeply and appear much redder than the cotton.

ON OTHER MATERIALS: Silk: The product on this fiber is fast to water but not fast to soap. Wool: Does not exhaust well onto wool, but is fast to fulling. Artificial silk: Suitable except for Lustron and Celanese.

DISCHARGING: Discharges white with hydrosulphite.

COMPETING PRODUCTS: Made in the United States by Newport Chemical Works, under the name of Direct Fast Brown BT.

BENZO AZURINE G

(Schultz No. 410)

COMPOSITION: Disazo.

SPECIALLY SUITABLE FOR: Cotton.

USUAL METHOD OF DYEING: With salt at the boil.

SOLUBILITY: Very good.

FASTNESS TO:

Acid: Fairly fast against muriatic; fast against acetic.
Alkali: Fair.
Chlorine: Destroyed.
Ironing: Not fast to hot pressing; goes redder.
Light: Very moderate; better when after-treated.
Rubbing: After-treated, fast; dyed and developed, fast.
Steaming: After-treated, shade is fast.
Washing: Very moderate.

DYED BY OTHER METHODS: When after-treated with copper sulphate, the shade is duller and greener, but much faster to light. Developed with beta-naphthol, the shade is slightly greener; with ethyl beta-naphthylamine, shade is slightly greener; with ethyl alpha-naphthylamine, the shade is redder and duller.

ON UNIONS: Cotton-wool unions: The wool is thinner and duller: Cotton-silk unions: The cotton is dyed darker than the silk.

ON OTHER MATERIALS: Wool: Dyed with Glauber salt and acetic acid; fast to perspiration, carbonizing and acid; fairly fast to stoving. Silk: Dyed with boiled-off liquor and acetic acid; fast to washing and acids; not fast to soaping.

DISCHARGING: Discharges white with tin or zinc.

COMPETING PRODUCTS: Made in the United States by American Aniline Products, Inc., under the name of Amanil Azurine 2G; Newport Chemical Works, under the name of Benzo Azurine BD Conc. and Benzo Azurine G Extra; Calco Chemical Company, under the name of Direct Bright Fast Blue; National Aniline & Chemical Company, under the name of Niagara Blue G; E. I. du Pont de Nemours & Co., under the name of Pontamine Blue AX.

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Chemist, technical school graduate with three years' textile laboratory and plant experience desires connections with progressive concern. Address Box 299, American Dyestuff Reporter.

Photomicrograph of wool fibre showing lime soap curds deposited on it by the hardness in water.

This photomicrograph shows clearly how clean fibres look when processed in Permutit softened water.

Are You Being Deceived by Your Water Supply?

Water is very deceiving. It constitutes by far the biggest raw material used in most textile mills, yet not one superintendent or manager out of a hundred ever thinks to study and analyze it as other raw materials are examined. If you do, you are an exception—one out of a hundred.

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Now glance at photograph on right. Note how clean the fibre is when processed in Permutit softened water. Such fibres will manufacture into the best grades of fabrics, and they represent a very valuable improvement in manufacturing.

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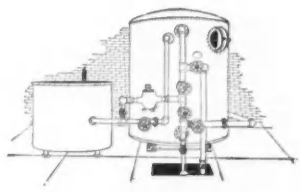

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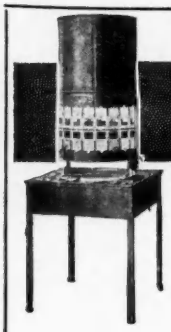

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